

TECHNOLOGY DEPARTMENT

The Chemical Age

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23 SEPTEMBER 1950

NO 1628

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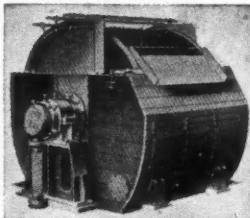


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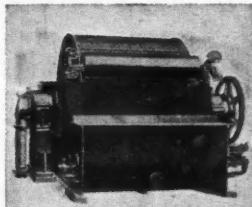
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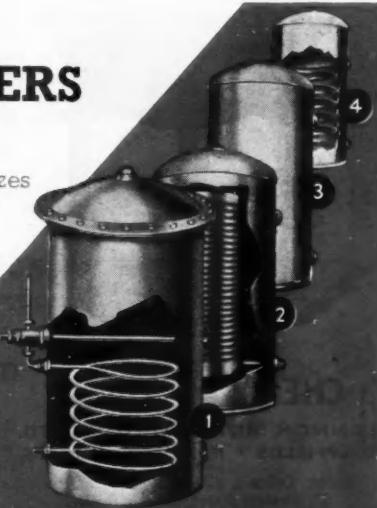
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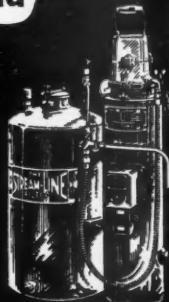
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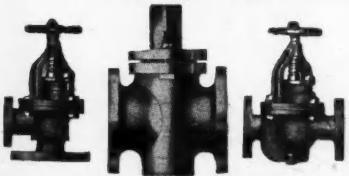
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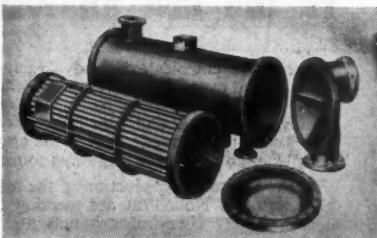
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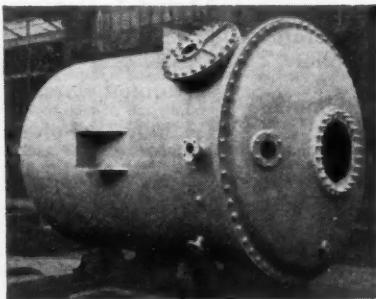
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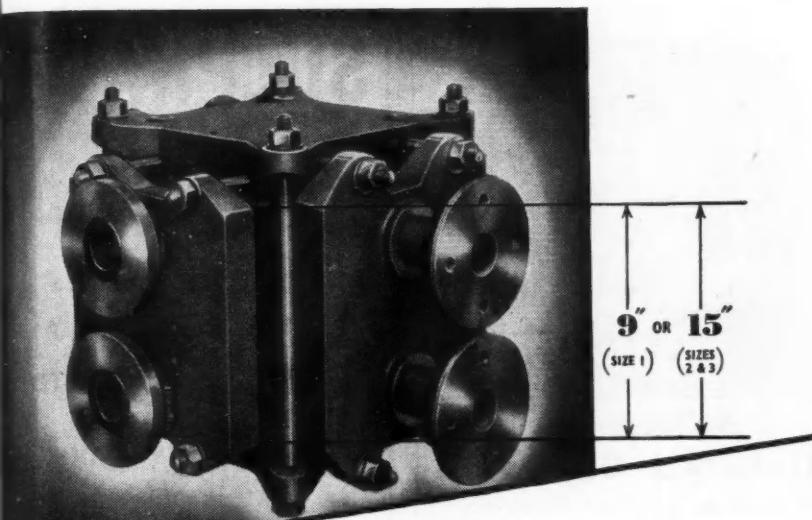
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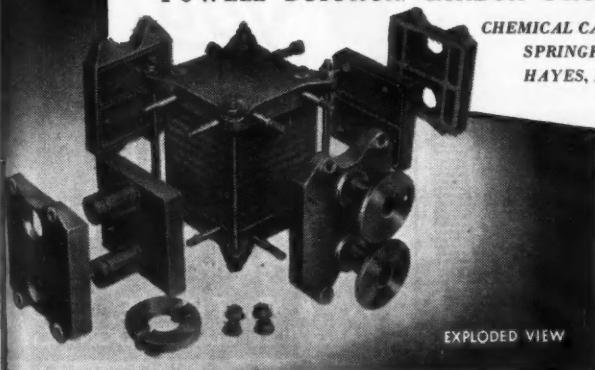
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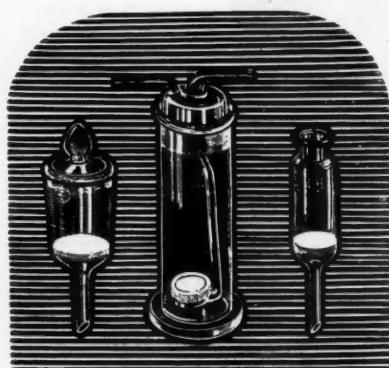
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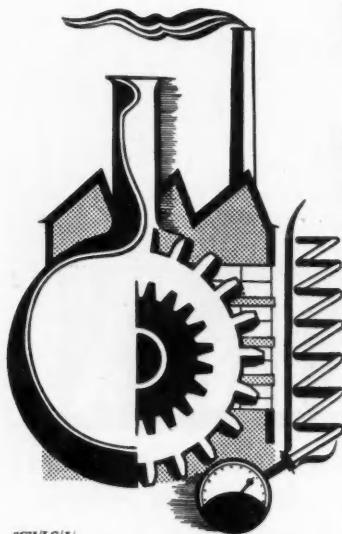
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Volume LXIII

23 September 1950

Number 1628

Dogmatic Stand on Steel

BY its decision to press on with the nationalisation of the iron and steel industry, regardless of the warnings and the opposition of practically every responsible spokesman on the other side, the Government has permanently dissipated the recent hope that it is capable of deferring at critical moments in the country's affairs the pursuit of purely doctrinaire objectives. To this fact alone must be attributed the abrupt substitution in Parliament during the past seven days of violent political dissension, in the place of the growing readiness to find common ground wherever compromise made it possible to present a united front to hostility without. The political scene since the Minister of Supply announced the impending appointments (to be effective on October 2) of the chairman, Mr. S. J. L. Hardie, chairman of the British Oxygen Company, and the deputy chairman and five full or part-time members of the Iron and Steel Corporation of Great Britain has confirmed what was wholly apparent to all in Parliament and nearly everyone else—that there is no common ground here on which to reach any kind of amicable arrangement, much less to gain the willing collaboration which would be needed to ensure that the iron and steel industry is not crippled by an ill-timed and needless experiment.

Had the Government's decision been taken at a happier juncture in world affairs it would still have merited most of the censure it is receiving now, as being a frivolous rebuff to the desire to see the country united in the common drive for economic improvement. The recent evidence that our need for arms—in which full supplies of steel are a primary essential—has acquired a new acute urgency made inexcusable the announcement on September 14 that there is to be no respite of the plan to "scramble" most of the sources of growing steel supplies in honour of a Socialist formula.

For those who distrust their own qualifications to judge the evidence for or against what is now proposed an authoritative verdict is to be seen in the absence from the proposed steel authority of those who have directed the iron and steel industries, whose leadership has produced in little more than four years a post-war growth which none of the nationalised industries seems able to approach. The reasons why the steel experts are taking no part in the plan to re-shape their own industry was made plain last week-end by Sir Ellis Hunter, president of the British Iron and Steel Federation. The steelmakers' president said this:

The federation has never deviated from

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its united opposition to the nationalisation of iron and steel, because of its conviction that it would be highly damaging both to the steel industry's efficiency and to the public interest. It has consistently represented to the Government that if their purpose is to ensure that the policies of the industry conform with national needs, then this objective can be better attained through a statutory board exercising supervisory functions, on the lines of the Iron and Steel Board which operated from 1946 to 1949.

The leader of the steelmakers' group has most appropriately recalled the statement in which the Minister explained his reasons, last November, for taking no action then to set in motion the State steel plan. On the eve of a General Election, the political chiefs thought it "plainly unwise in an atmosphere of political tension and uncertainty to proceed with the selection of individuals to serve on the corporation." Now the Government has revived a condition of political insecurity as widespread as in the autumn and, what is worse, has failed to satisfy one of the essential conditions for nationalising a highly specialised industry.

In November, Mr. Strauss stated as an axiom that the success of the nationalised industry "will depend to a considerable extent on the calibre of the men serving on the corporation, and that it would be folly to rush our

selection of these people unnecessarily." While there is no evidence showing—or disproving—that the present appointments were "rushed," they will certainly be seen as make-shifts by those who are acquainted with the drive, reinforced by deep knowledge of steel processes and steel needs, possessed by many of today's steel men. It constitutes no criticism of the first chairman's proved ability in his own vital section of modern industry, or of the various capabilities of the others named, to assert that if such a body is indeed required there are others much better fitted to compose it. There are some grounds for thinking that Mr. S. J. L. Hardie himself would not reject that proposition. His statement last week that he had accepted "with some reluctance" the Government's invitation to make a break with his life-long industrial sphere, but had been persuaded by the overriding importance of the steel industry, seems to place the whole project on the level of a national misfortune, whose worst results some public spirited individuals will make personal sacrifices to avert. One, Mr. R. A. Maclean, a part-time member, has already decided that the cause does not warrant the stifling of his convictions—and withdrawn.

Notes and Comments

Capital Problems

RISING capital to maintain chemical industries and permit only essential modifications required for healthy competitiveness is not the simple process which the ready response to some recent public issues would seem to have indicated. That is now stated to be the reason why I.C.I., Ltd., elected to secure its very much larger capital needs, represented by the recent issue of £20 million medium-term loan stock, from the insurance companies, rather than from present stockholders or the general public. I.C.I.'s reasons for bypassing the traditional source of capital, which occasioned at the time hard feelings among some private investors and the stock market, have been set out by the group's finance director, Mr. S. P. Chambers, in *The Financial Times* (September 16), and in general supply expert confirmation of the current view that private savings, diminished by taxation and other inflated charges, are incapable of absorbing issues of this size without serious disturbance of the values of existing investments. Most of the evidence offered in support for this diversion from the usual channels, which is represented as being only a temporary expedient, is shown to stem from the current policy in regard to taxation. In the view of I.C.I.'s finance authority, the supply of equity capital has been severely discouraged by high taxation of the return on ordinary shares, which the alternative of a preference issue would only serve to heighten. The same factor has diverted a large proportion of investment to the life assurance companies, which are represented now as the collective dispensers of what remains of private savings. Fortunately, in view of the serious objections to the concentration of capital interests of such fundamental industries as I.C.I.'s, the recourse to the insurance companies is not seen as a permanent

solution. "It is no substitute for equity capital, which must always form the main element of all permanent capital," affirms Mr. Chambers.

New Facts about Gases

THE increasing size of the contribution being made by U.S. workers in some fundamental departments of science has received evidence chiefly in what has been done in making known "unnatural" behaviour of gases, of which the remarkable propensities of helium at extremely low temperature have now been followed, at Yale University, by some equally remarkable observations about gases at 50,000 p.s.i. Russian workers are accredited with having recorded, about eight years ago, some of the abnormal conditions which Professor Barnett F. Dodge and A. E. Lindroos have now investigated. The Yale report says, however, that while the U.S. data were "qualitatively similar" they had also uncovered other facts which were quantitatively quite different. The arresting aspect of the American study, the fact that two gases which mix intimately in normal conditions will separate into two distinct layers at 50,000 p.s.i., is not entirely a new discovery. What will perhaps arouse even more interest are the American observations of "barotropic phenomena." The high pressure laboratory has recorded instances of the light gas changing position with the heavier gas when extreme pressure is applied.

Interdependence of Research

THE arbitrary sub-division of chemistry into organic and inorganic and other sections, though convenient, sometimes leads to a peculiarly limited mode of thought when applied too rigorously. An example of this is afforded by crystal chemistry which offers a suitably easy method for explaining the inter-atomic structure of the molecule. In the past it was the organic chemist who concerned him-

self with spatial arrangement rather than his inorganic colleague. Latterly it has been realised that the structure of the molecule is of vital importance in the explanation of certain phenomena such as semi-conductors and piezo-electric effects. Consequently there is now an increasing interest in the architecture of the molecule because of the great possibilities inherent in the practical applications of these things in the development of new scientific tools and equipment. Not least of these is the ability of the crystal of pure germanium to act as a rectifier; it is possible that it will replace the thermionic valve as an amplifier in some circuits. The uncertainty as to the cause of this property of germanium, which is known to be considerably affected by imperfections in the crystal lattice—among other things—helps to underline the fact that chemistry, though subdivided, still remains an entity, of which each section has much to learn from the others.

Smoke and Public Health

ALTHOUGH some optimistic proposals to set up smokeless zones in towns with legal sanctions to enforce them have experienced some setbacks there is no abatement of vigour in the renewed attack on the practices which load the air with smoke and products very much more pernicious. The National Smoke Abatement Society

intends, at its annual conference at Margate next week, to establish the responsibility of industrial fogs for much more serious results than partial blackouts and general discomfort. It has forceful allies in the medical profession, some of whom at Margate will testify to the lethal possibilities, of which there is no lack of circumstantial evidence. Dr. J. S. G. Burnett, Preston's MOH, has prepared an incriminating dossier based on recorded rises in localities' death rates during periods of smoke fogs, supported by additional evidence from Belgium and the U.S.A., where the death roll of at least 20 during four days of "smog" in Donora provided tragic proof of what sulphur dioxide and acid laden carbon particles can do. Those are a small part of the very dangerous substances to which some chemical and metal industries may give rise. One, benzopyrene, is to be discussed at Margate by a specialist from St. Bartholomew's Hospital, Mr. R. E. Waller, who will show there is at least a *prima facie* case for attributing to it some of the incidence of cancer of the lung. Even if this cannot be fully substantiated there is little, except the comparatively high cost of filtration and monitoring equipment, with which to answer the case for arresting most of the gases and solids which pass through the smoke stack. A few are nearly as valuable as germanium.

Scottish Chemists Demand—and Get—a Hearing

PERSISTENT refusal of the Secretary of State for Scotland (Mr. Hector McNeil) to meet them in person was alleged in a statement issued last week by the Pharmaceutical General Council (Scotland) regarding the proposed withdrawal of a number of Scottish chemists from the National Health Service.

The council emphasised that the chemists have all along been willing, and indeed anxious, to have arbitration proceedings continued immediately.

"What the chemists strenuously object to," the statement continued, "is that before the Secretary of State enters into arbitration proceedings, he arrogates to himself the right to impose a cut, of the justice or injustice of which he cannot be

aware without investigation which neither he nor his staff have undertaken."

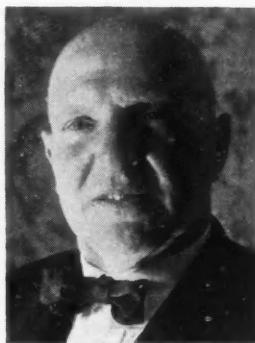
In the House of Commons last Monday, in a written answer, Mr. Hector McNeil reiterated his arguments in defence of the eight per cent reduction in payments and stated that he proposed to invite the chemists' representatives to meet him in the near future.

Chemicals at Grangemouth

A further stage in the extension of chemical production at Grangemouth is foreshadowed by the granting by the Dean of Guild Court there of permission for a £34,000 extension to the I.C.I. plant. The new factor will be used for the production of organic chemicals and dyestuffs.

STEEL CORPORATION APPOINTMENTS

Experts Omitted : One Member Withdraws



The first chairman

THE culmination of strong controversy which for nearly two years has surrounded the Government proposal to nationalise most of the productive capacity of the iron and steel industry and many associated fabricating interests was reached in the House of Commons on September 14. The Minister of Supply (Mr. George Strauss) announced the appointment of the chairman, deputy chairman, three full-time members and two part-time members of the Iron and Steel Corporation of Great Britain.

The securities of the companies named in the third schedule to the Act, said the Minister, would vest in the corporation on January 1, 1951, or as soon as practicable thereafter. When the corporation was set up he proposed to consult its members about the earliest convenient date, and would make a further announcement.

On Tuesday this week an Opposition motion of censure, after six and a half hours' debate, was defeated by six votes.

First Officials

The first members of the corporation were announced to be these:

Mr. S. J. L. HARDIE, chairman of the British Oxygen Co., Ltd., vice-chairman of Metal Industries, Ltd., and chairman or director of several other industrial firms.

Deputy chairman: SIR JOHN GREEN, director of Thomas Firth and John Brown, Ltd., and chairman of the central conference of the Engineering and Allied Employers' National Federation.

Full-time members: SIR VAUGHAN BERRY, British delegate to the International Authority for the Ruhr; GENERAL SIR JAMES STEELE, Adjutant-General to the Forces; Mr. W. H. STOKES, of the Amalgamated Engineering Union and chairman, Midland Regional Board for Industry.

Part-time members: MR. J. W. GARTON, chairman of Brown Bayley's Steel Works, Ltd., and managing director of the Hoffmann Manufacturing Co., Ltd.; Mr. R. A. MACLEAN, chairman of A. F. Stoddard and Co., Ltd., director of Scottish Industrial Estates and other commercial concerns.

Their salaries will be: chairman, £7500; full-time members, £5000; part-time members, £500.

One Withdraws

Four days later (September 18) Mr. R. A. Maclean withdrew his acceptance of a seat on the corporation. He wrote then, in a letter to the Minister: "I am an industrialist, not a politician, and the intense political controversy surrounding the setting up of the corporation has created an atmosphere in which I could not usefully or happily serve. . . . Anyone accepting an appointment to the corporation ought to be prepared to identify himself with and support the policy of iron and steel nationalisation. This is an undertaking I was not asked to give and one I am not willing to accept."

The difficulty which the Government has experienced in finding suitable officers has been underlined by the conspicuous omission of foremost individuals in the iron and steel producing industries. A statement by the president of the British Iron and Steel Federation, following the Cabinet decision, amplified the anomalous situation. Sir Ellis Hunter disclosed that the federation had informed the Minister of Supply that it could not accede to his request to suggest the names of persons who might serve on the corporation.

"It has consistently represented to the Government that if its purpose is to ensure that the policies of the industry conform with national needs, then this objective can be better attained through a statutory Board exercising supervisory functions, on the lines of the Iron and Steel Board which operated from 1946 to 1949," he wrote.

Even more remarkable has been the absence from the corporation of trade union leaders associated with iron and steel production.

SMOKE ABATEMENT Society's Twenty-first Conference

HEALTH and the better burning of fuel will be the main themes for the 400 members and delegates who will be meeting at Margate on September 27 for the 21st annual conference of the National Smoke Abatement Society, which continues until September 29. This will be marked by the presentation of the first Des Voeux memorial lecture, read in honour of the society's first president, Dr. H. A. Des Voeux, who helped to found one of its two parent bodies in 1899.

These lectures will be of more than usual significance and scope, and are intended to relate smoke abatement to subjects of wider national interest. The first is to be by Dr. D. T. A. Townend, formerly professor of fuel technology at Leeds University and now director-general of the British Coal Utilisation Research Association. His paper, "Towards the Better Use of Coal," will be scientifically important and topical.

Medical Evidence

Two papers on the relation of smoke to respiratory disease will be read, one by Dr. J. S. G. Burnett, medical officer of health for Preston, and the other by Mr. R. E. Waller, of the department of pathology, St. Bartholomew's Hospital. Dr. Burnett will discuss the increased mortality during smoke fogs, both in this country and in the disastrous cases that have occurred in Belgium and the United States. Mr. Waller is to give an account of experimental work in progress relating to the frequency of cancer of the lung in towns as compared with country areas, and to the presence in town air of a cancer-producing substance, benzopyrene, of which the domestic coal fire is the likely source.

At another session the question of preventing smoke in new housing, by using modern methods and smokeless fuels, will be discussed in a series of short papers, including one on the new towns and one on the first plans for including housing areas in smokeless zones, where all smoke will be prohibited. Finally, the widespread problem of railway smoke will be surveyed in two papers, in one of which an officer of British Railways will describe how they are attacking it.

A novelty is being provided by British Railways which has arranged that one of their instructional trains will be at Margate station, in which delegates will see working parts of locomotives and films.

NEW I.C.I. STOCK HOLDERS

£7.5 m from Prudential Group

HOLDERS of the £20 million 4 per cent unsecured loan stock recently placed privately by Imperial Chemical Industries, Ltd. (THE CHEMICAL AGE, 63, 351), were published this week.

The quotation was taken up by 83 different insurance companies and other institutions, of which the Prudential Assurance Co., Ltd., is the largest individual holder with £7.25 million. A further £250,000 stands in the names of Prudential nominees.

Next largest holder is the Sun Life Assurance Company of Canada (£1.5 million) followed by the Legal and General Assurance Society, Ltd. (£1.25 million), with the Pearl Assurance Co., Ltd., and the Refuge Assurance Co., Ltd., each subscribing £1 million.

Glaxo Enterprise in Canada

PROMOTION on a considerably larger scale of sales in Canada of Glaxo Laboratories, Ltd., is the object of the formation, announced this week, of a new subsidiary, Glaxo (Canada), Ltd. It will have its head office at Saxony Building, Duncan Street, Toronto. Mr. Joseph Hutchinson has been appointed managing director and has been accompanied to Canada by Mr. L. A. Gullick, who has been appointed a director. Mr. Hutchinson, formerly home sales director at the company's Greenford division, previously spent 10 years in Canada for Glaxo Laboratories, Ltd. Mr. L. A. Gullick was formerly in the home sales department and more recently manager of the Glaxo plant at Barnard Castle.

Gap in Coal Stocks

THE failure of the National Coal Board to raise coal production to match current needs was recognised in an answer in the House of Commons by Mr. Alfred Robens, Parliamentary Secretary to the Ministry of Fuel and Power. He said it had been decided a few days earlier by the emergency committee of the National Productivity Advisory Council that industrial stocks should be built up to a level of about four and a half weeks' supply—a good safety margin—by mid-December.

Industrialists would be required during that period to take coal offered them; it would be of no use for them to refuse deliveries from pits other than those by which they were usually supplied. They would not be required to accept different qualities.



Sir Robert Robinson, O.M.

GAS INDUSTRY RESEARCH

Prominent Chemists Appointed



Sir Cyril Hinshelwood

THE Gas Council has set up a research committee consisting of Sir Edgar Sylvester, chairman of the Gas Council, and, as men of science not engaged in the gas industry, Sir Robert Robinson, O.M., and Sir Cyril Hinshelwood; Mr. E. Crowther, Dr. R. S. Edwards and Mr. W. K. Hutchinson, members of the Gas Council; Mr. F. M. Birks, president of the Institution of Gas Engineers, and Professor A. L. Roberts, Livesey Professor at Leeds University.

The laboratories of the North Thames Gas Board have been recognised as the nucleus of a London research station, and Dr. H. Hollings, who for some years has been controller of those laboratories, has joined the committee as director-designate of the station.

Sir Robert Robinson, who was awarded the Order of Merit in 1949, is a graduate of Manchester University. A Longstaff medallist and Davy medallist, his research in organic chemistry covers a wide field, including studies in the alkaloids and the phenanthrene derivatives. He was appointed professor of organic chemistry at Sydney in 1912 and Heath Harrison professor of organic chemistry at Liverpool in 1951. He became director of research of the British Dyestuffs Corporation

Ltd., in 1920. Sir Robert Robinson's other distinctions, in chronological order, include the professorship of chemistry at St. Andrews (1921), the professorship of organic chemistry at Manchester (1922), University College, London (1928), and Waynflete professorship of chemistry, Oxford (1930); Paracelsus medallist, Swiss Chemical Society (1939). He was president of the Chemical Society (1939-41) and was elected president of the Royal Society in 1945. He was knighted in 1939 and awarded the Nobel prize for chemistry for 1947. He is a past vice-president of the Union Internationale de Chimie.

Sir Cyril N. Hinshelwood is distinguished for his work on the kinetics of reactions chemical and bacteriological. He is a graduate of Balliol College, Oxford, and was lecturer in chemical dynamics at Oxford from 1927 to 1937, when he became Dr. Lee's professor of chemistry at the same university. His other appointments and awards include the Lavoisier medal of the Société Chimique de France (1935); the Davy medal of the Royal Society (1943) and the Royal medal (1947); Longstaff medal of the Chemical Society (1948). Professor Hinshelwood was president of the Chemical Society from 1946-1948.

Strike Cuts Gas Supplies

DISSATISFACTION with the award of a wage increase of 1½d. per hour was given as the reason for a strike last week-end by some 600 maintenance engineers at a number of gas works of the North Thames Gas Board. The number on strike was increased on Monday by about 400 employed at other gas works of the North

Thames group. Gas supply was reported in some areas on Monday to be running low and by mid-week widespread gas cuts in several localities in S.E. England had occurred. By then 17 gas works and a by-products plant were affected and some two million consumers were receiving reduced gas supplies.

COSTLY PETROCHEMICAL EQUIPMENT

Why Operating Company Needs Another £2.5 M.

THE need to increase the company's borrowing powers to permit negotiations for additional capital up to £2.5 million was explained by Sir Robert Renwick in his speech, as chairman, at the extraordinary general meeting of Petrochemicals, Ltd., in London on September 18. The need for the increased capital was occasioned largely by the heavy cost of plant construction delays. The company's programme for construction at Partington had, he said, fallen sadly by the wayside, and his most optimistic forecast now was that full operation would be achieved by the spring of 1951.

Exacting Separations

On the liquid side, the various constituents of the crackylate—the aromatic product of the Catarole furnaces—had to be separated and purified. Any bottleneck in the individual operations could prevent a whole subsequent series of operations taking place. There had also been serious delays in bringing this group of plants into commercial production and, to achieve the maximum purity of the individual products and the minimum waste, they had to work to very close specifications.

A serious delay had occurred in the gas separation plant, which was essential to over 50 per cent in value of the company's ultimate production. This plant was of special design, and therefore was full of teething troubles and problems. The accumulation of delays in bringing the plants into full commercial production was one of the prime causes of the very heavy running-in losses.

Since 1949 the situation had been further aggravated by the increased charges for interest and depreciation due to the delays and the increased construction costs and to the fact that devaluation had raised the cost of the company's charging stock, fuel, and essential chemicals by some £450,000 a year. Additionally, the sale of surplus gas to the gas works would be less than anticipated, for reasons quite outside the company's control.

The net profit envisaged in September, 1949, of £400,000 per annum, after charging interest and depreciation, had been absorbed. It appeared unlikely that there would be any worthwhile surplus, at any rate in the early years.

More than half of the £2.5 million for which he was negotiating would be required

to meet the running-in losses incurred or estimated to be incurred before the whole plant was in commercial production, and the continuing overheads on design and construction. Of the remainder, under £1 million would be invested in plant, of which some £350,000 would be necessary to meet the increased cost of the plants now completed or nearing completion. A further £350,000 was required for certain improvements and modifications to the plants. £180,000 represented the company's share of extra capital required for its associated companies, Styrene Co-Polymers, Ltd., and Styrene Products, Ltd., where there had been a similar story of higher construction costs and serious delays.

Summing up, Sir Robert Renwick said once the plant was in full production and had been proved to operate satisfactorily over a continuous period, it was envisaged that opportunities would arise for the erection of further conversion plants for the production of a number of chemicals commanding high prices. For these the additional capital cost was relatively low.

Industrial Alcohol Prospects

REFLECTING, it is thought, heightened activity in most industries, the demand for industrial alcohol and related chemical products had shown a substantial increase during the past year, stated Mr. H. J. Ross, chairman at the annual general meeting (reported fully on pages 444-447) of the Distillers Co., Ltd. The improvement included an expansion in the company's direct chemical export trade.

A year ago there appeared to be a prospect of securing forward supplies of molasses at reasonable prices, and the company was fortunate in covering its requirements for the greater part of the current year. The further outlook, however, was much less favourable, due partly to the poorer Cuban crop last season, coupled with the unforeseen high demands for molasses throughout the world, and particularly from the U.S.A. There appeared to be every likelihood of a substantial rise in the price of molasses, but his company's purchasing arrangements through the United Molasses Co., Ltd., would, it was hoped, safeguard its position as far as was possible in that difficult market.

U.S. SAFEGUARDS SUPPLIES

Restricted Dealing in Chemicals

THE need to enforce restraint in the U.S.A. on over-buying, to which the influence of the current arms programme might give rise, was recognised by the statutory control, as from Monday, of private purchases of over 30 materials which may become scarce. An order of the National Production Authority has rendered it illegal for manufacturers or dealers "to buy, receive, order or deliver more than a practicable minimum working inventory" of a list of basic products, many of which are associated with the chemical process and metal industries.

The same principle animated an earlier order by the U.S. Secretary of Commerce with the purpose of reducing U.S. domestic consumption of new natural and synthetic rubber in the last four months of this year to 90,000 tons, instead of approximately 110,000 tons.

The list of commodities, the excessive buying of which has been prohibited, includes these:—

Industrial alcohol, benzine, caustic soda, chlorine, glycerin, and soda ash; wood pulp; pig iron, grey iron castings, carbon and alloy steel, rough forgings, iron and steel scrap; aluminium, columbium, cobalt, copper and scrap containing copper, magnesium, manganese, nickel, tin, tungsten, zinc, other non-ferrous scrap; rayon yarn, nylon staple, and nylon filament yarn.

MOS Discusses Copper Premiums

PROBLEMS of finding an alternative to the present system of premiums on forward purchases of copper are now under discussion with the industry, according to a statement in the House of Commons by Mr. George Strauss, Minister of Supply.

Premiums which were recently heavily increased (THE CHEMICAL AGE, 63, 354) were, said the Minister, imposed to protect the Exchequer from the results of heavy forward buying at a time of uncertainty about future buying prices. It was hoped that the discussions might result in some other more acceptable method.

Burden on Railway Charges

THE Federation of British Industries has sent the Minister of Transport, this week, a reasoned case against the maintenance, at the cost of railway users, of large unused surplus capacity on the railways, preserved for strategic reasons. The FBI argues that this is imposing unfairly on peacetime transport charges a burden which should be borne by the Defence Estimates. Some of the existing railway capacity and facilities, the memorandum suggests, might safely be dispensed with.

ACCIDENT PREVENTION

Frequency Reduced by 67 per cent

SOME successful principles by which large improvements have been made in the incidence and severity of accidents in one U.S. chemical group have recently been summarised. Dr. G. M. Hebbard, vice-president of the Davison Chemical Corporation, which has received two of the principal safety awards of the U.S. National Safety Council, has stated that one of the first essentials is that every accident, trivial or not, should be traced to ascertain its basic causes.

The company during 1949 reduced by 67 per cent the frequency of accidents in its phosphate rock division and halved the rate of severity. Its figures for the year represent only 22 per cent of the average accident frequency in its own industrial group and a severity rate of only 5 per cent. The company is reported to have received a rebate of more than \$90,000 from its industrial insurance company.

Dr. Hebbard states that when, having traced an accident to its causes, a hazardous condition was discovered, the company looked for the cause in management procedures first, in the design or operation of equipment second, in the methods of worker training third, and in the thinking and work habits of the workmen last. Safety practices were interwoven with job training and instruction. The management followed up with carefully detailed committee consideration every accident and every hazard. One man was directly responsible for safety practices in each plant, whatever its size.

By use of photographs and of accident report forms the development of safety was turned into the equivalent of an engineering operation.

Tritium in Heavy Water

THE research institute of Temple University, Philadelphia, U.S.A., announced at the end of last week the discovery in heavy water of tritium, the hydrogen bomb explosive. Tritium, as made in atomic reactors, at present costs over £178 million a pound.

The natural tritium was discovered with the spectroscope—in samples of heavy water from England and Norway—by Professor W. F. Libby, of the institute of nuclear studies of the University of Chicago, and Professor A. V. Grosse, of the Temple University research institute. There is at present no way of extracting pure tritium from heavy, or other, water.

TANNIN IN CHEMICAL ANALYSIS

Accurate Methods for Radioactive Mineral Assays*

THE organic reagents generally used in acid-earth analysis are tannin and cupferron. Cupferron, ammonium-nitroso- β -phenyl-hydroxylamine, reacts in either strongly or weakly acid solution, and the control of the degree of acidity is of the utmost importance. Generally, cupferron precipitates the following elements in strongly acid solution: Ce^{IV}, Nb, Ga, Fe, Ta, Sn, Ti, W, U^{IV}, V, Zr and Hf, using 5 to 10 per cent sulphuric or hydrochloric acid. In weakly acid solution cupferron precipitates Al, Bi, Ce^{III}, Cu, Pb, Hg, Ag, and Th, but these precipitations are not always quantitative.

Disadvantages of Cupferron

Unfortunately, cupferron has several disadvantages when used in chemical analysis. It is very unstable and decomposes in contact with air, and thus cannot be kept for any length of time. In the determination of thorium, cupferron has no advantage over ammonium and is unreliable in the estimations of vanadium. There is nothing to be gained in the use of cupferron when compared with the gravimetric determination of iron or copper. In the cupferron precipitations titanium and vanadium accompany the iron.

Apart from its usefulness in separating aluminium and chromium in the analysis of titanium and zirconia, cupferron is useful as a reagent only when the general composition of the mineral to be analysed is known. It is not a sufficiently selective reagent to effect separations in solutions containing more than a limited number of elements.

For the recovery and separation of the acid earths, tannin is much more satisfactory. In addition to being more stable, tannin is cheaper and more efficient, while the separations are not so laborious.

Tannin, digallic acid ($C_{14}H_{10}O_6$), is soluble in warm water, forming a suspension of negatively charged particles, and its use in analysis is based on its ability to precipitate positively charged soils of metallic hydroxides by means of reciprocal flocculations. Although the precise nature of the reactions is not completely understood, it is possible that the formation of adsorption complexes takes place

and that the precipitation is caused by the neutralisation of the colloid charges by the opposite charges of the inorganic ions.

The precipitates are very flocculent but are readily filtered. This is most conveniently done in a slight vacuum, mixing the precipitates with a small quantity of paper pulp. The tannin precipitates must be well washed with solutions of a volatile electrolyte, such as ammonium nitrate or chloride (mixed with a little tannin) which assists in the final calcination of tannin. After calcination of the precipitate, the residual oxides form a soft powder which rapidly attains a constant weight, and which is easily fusible with potassium bisulphate.

Tannin is indispensable in the analysis of tantalum, niobium and titanium. It quantitatively precipitates the acid earths and other metals from tartaric acid solutions, and under specific conditions it quantitatively precipitates tantalum, niobium and titanium from oxalic acid solutions, the other elements present with the earths remaining in solution. The tannin precipitations must be carried out either in neutral solutions or in solutions only slightly acid or alkaline. An excess of mineral acid or ammonia can prevent any precipitation of the tannin complex and for these reasons the pH of the solutions must be carefully controlled.

Besides the need for an excess of the flocculating agent, the tannin must be added in hot solution, of between 2 and 5 per cent, depending upon the precipitations. If the solution is boiling flocculation is more complete and the precipitate settles more rapidly. The amount of tannin added must be at least 10 times that of the oxides to be precipitated.

Separation of Titanium

In the analysis of tantalono-biates, excluding minerals containing radioactive elements and rare earths, the oxides of Fe, Al, Zr, Mn, Be, U and V are all collected together after the removal of the tantalum, niobium, titanium and tungsten. Instead of precipitating iron and manganese with H_2S , the titanium is first separated by precipitation with tannin in oxalic acid solution. The filtrate contains the oxides of Fe, Mn, Al, Zr, etc., and is made alkaline, and the oxides are precipitated with ammonia, after which the iron and manganese are separated.

For minerals containing much titanium

* Abstract from "The Use of Tannin in Chemical Analysis" by L. L. Colin, M.I.M.E., M.I.M.M. (London) Ph.D. in *The Journal of the Chemical, Metallurgical and Mining Society of South Africa*, 53, 12, 314.

this procedure gives more accurate assays for the iron, because the sulphide precipitates generally carry down some titanium.

Tannin will separate uranium from alkaline solution as a brown flocculent precipitate, which can be filtered off very rapidly. In certain conditions tannin quantitatively separates uranium from titanium and this property is the basis of a very rapid and accurate method for the analysis of uranium in radioactive ilmenites. For the qualitative determination of uranium an ultraviolet fluorescent method can be used, although vanadium may interfere when low grade samples are being assayed.

The success of the method used for the analyses of the acid earths and rare earth minerals depends upon the early separation of titanium by tannin precipitation in a solution rendered slightly acid with oxalic acid. Tannin quantitatively precipitates Ta, Nb and Ti from a weakly acid oxalate solution semi-saturated with ammonium chloride. Zirconia, thoria, alumina, beryllia and uranic oxide are not precipitated in these conditions.

An illustration of this separation is given by an analysis of a synthetic sample made up to contain the equivalent of: 0.1250 gm Fe₂O₃; 0.2500 gm TiO₂; 0.0086 gm V₂O₅; 0.0600 gm U₃O₈.

The titanium was separated in a weakly acid oxalate solution, semi-saturated with ammonium chloride and the filtrate was made alkaline to precipitate the remaining oxides together. After fusion, the iron was precipitated in an alkaline solution with ammonium carbonate. The filtrate was treated with tannin and the precipitate of vanadium and uranium oxides was calcined and fused. The vanadium was separated from the uranium by precipitation with tannin in a weakly acid solution

of acetic acid and ammonium acetate. The recoveries were: 0.1247 gm Fe₂O₃; 0.5030 gm TiO₂; 0.0088 gm V₂O₅; 0.0601 gm U₃O₈. The impurities in the titania and uranium oxide precipitates were found to be iron.

The determination of uranium in complex minerals is best begun by a rapid separation of the rare earths. Thoria and the oxides of cerium, terbium and yttrium form insoluble fluorides, while the other minerals, including Ta, Nb and Ti, are soluble.

The precipitation of the rare earths in the cold with ammonia and a minimum of ammonium chloride is preferable, since the rare earths have a tendency to dissolve when the alkaline solutions are boiled, afterwards depositing as a fine white powder as the filtrate cools.

To precipitate thoria, sebacic acid is better than sodium thiosulphate, which introduces troublesome colloidal sulphur and is also more laborious in use. With sebacic acid, the thoria precipitate collects rapidly and is readily filtered.

Tannin gives a dark blue precipitate with vanadium of extreme sensitivity, effective at one part in ten million. A great advantage of the use of tannin in the final separation of vanadium is that the colour of the solution gives an immediate indication of whether the vanadium is present in appreciable quantities or is entirely absent. The preliminary treatment of the solution with ammonia and ammonium carbonate removes the oxides of Fe, Si, Al, Ti, etc., while the tannin precipitation of the filtrate in a weakly acid solution of acetic acid and ammonium acetate obtains the vanadium free of all other elements. The final volumetric determination with potassium permanganate effectively obviates the danger of silica intrusion.

Research to Improve Road Surfaces

THE Road Research Laboratory of the Department of Scientific and Industrial Research has carried out extensive experiments to develop an effective way of ensuring that freshly laid surface dressings are not spoiled by rain. Stone chips used as surfacing material become damp when stored on the roadside and the moisture causes poor adhesion when the chips are spread on the tarred surfaces.

It was discovered that the water on wet stone is displaced if the stone is treated with creosote containing a "wetting" agent.

A solution of creosote and cetyl pyridinium bromide proved to be completely successful in this respect. The best method of coating the stone is in a large

mixer, for instance, at a quarry, but for stone already dumped at the roadside a concrete mixer is more convenient. The surface dressing will then stay on the road no matter how hard or how soon it rains after the dressing has been laid. The solution may also be sprayed on the top of the tar film before the stone chips are applied. This method is not quite so effective as using treated stone.

The treatment adds between a penny and threehalfpence per square yard to the cost of surface dressing. Expenditure on surface dressing each year is between £8 million and £12 million and considerable economy should result from making the process more certain, despite the increased costs.

Synthetic Mica Experiments

Partial Success of U.S. Research Project

MICA, in a form suitable for use in radar and radio equipment, has been produced synthetically in substantial quantities at the Colorado School of Mines, as a result of the four-year research project carried out there. Research has also been carried on, with the use of crucibles, by the U.S. Bureau of Standards, Washington, D.C., and the U.S. Bureau of Mines at Norris, Tenn.

Cakes of mica, weighing up to 500 lb., have been formed at the Colorado School of Mines by a new cool hearth method. The process avoids the use of crucibles and the molten mica is contained in a basin of unmelted raw mixture from which the melt was derived. Crystallisation takes place in this melting basin which forms a centre pool surrounded by a solid cool mass of the unmelted raw mixture.

Elimination of Crucibles

The two largest contributions made by the mines school in the synthetic mica project come in the fields of elimination of crucibles and employment of a travelling hearth, states a report by Dr. Aitkenhead, of the Colorado School of Mines. No crucible material has ever proved completely satisfactory, he says. Platinum, probably the best yet found, is twice as costly as gold and much too expensive for practical use. In addition, the mica cake adheres tenaciously to the platinum, necessitating considerable battering of the crucible to remove it.

Graphite is rapidly deteriorated by oxidation at the high temperatures needed to melt the raw material, and will always contaminate the mica with fine particles. Silica-alumina ceramics are all attacked by the melt.

For the melting, a natural gas flame was played from above directly over the centre of the raw mixture. The material forming the hearth of the furnace travelled at a rate of about one inch per hour, under the heat. Melting occurred on the leading edge, crystallisation on the trailing end of the molten pool. This made the process semi-continuous and provided accurate control of the cooling rate.

The melt covered itself with a blanket of viscous defluorised material which appeared as a warty crust when the mica cake was solidified. This property of the melt in automatically covering itself im-

peded fluoride loss and made it possible to obtain fairly pure mica by crystallising a cool hearth melt.

It was thus possible to adjust the composition of the raw material of ingredients to components for inevitable fluorine loss, assuring a uniform fluorine content of the crystals. Low fluorine mica is hard and tends to show a glassy lustre. Mica with too high a fluorine content is chalky and splittings reveal interlamellar impurities.

Mica of exceptional clarity and flexibility resulted. However, few crystal faces of sufficient size were produced, and when large faces were observed they were so thin and entangled in the crystalline mass that they were always broken in trying to extricate them. To meet commercial demands crystals would have to be produced in sizes of 1 in. by 2 in. at least, Dr. Aitkenhead believes. Only a few as large as that have been produced.

Research directors of the school state their belief that the best mixture of raw material is composed of pure potassium silicofluoride, silica, alumina and magnesia. Individual ingredients were ground together, very finely, to promote the most intimate contact between the particles. The best crystallisation was achieved in a run in which the furnace was heated to a maximum of 1510° C. in 11 hours. After two hours the temperature began to drop, indicating that melting had begun, and after 17 hours' total heating time the movement of the hearth was started and continued at a rate of 1 in. per hour for 20 hours. The furnace was cooled at a rate of 10° C. per hour for 18 hours. This test gave the best crystallisation and purest mica yet produced.

Parallel Crystallisation

The effects of seeding and rocking in efforts to bring about parallel crystallisation of larger particles were virtually nil. In one run seeding did cause parallel crystallisation to start, but less than an inch up the cake gave way to the usual random formations.

Dr. Aitkenhead says: "We do believe, however, that a considerably deeper melt, cooled so that crystallisation from the top down would be avoided, would produce a certain yield of acceptable mica splittings, even though there was no parallelism.

(continued on page 430)

SULPHATE-REDUCING BACTERIA

Recent Practical Progress by the CRL

Some outstanding evidence of the scope for the application of biological methods to industrial problems has been afforded by the investigations of the Chemical Research Laboratory into sulphate-reducing bacteria and their control (THE CHEMICAL AGE, 63, 290). Fuller details of the odorous activities of these bacteria were given in a paper entitled "Sulphate-Reducing Bacteria" presented to the Society for Applied Bacteriology* by Mr. K. R. Butlin, of the Microbiology Section, CRL, who recalled what was probably the largest recorded eruption of H_2S into the atmosphere. This took place in 1938 at the small coastal town of Swakopmund in South-West Africa. Heavy sulphurous fumes emanating from the sea spread as far as 40 miles inland. According to a Press report the atmosphere was like a London fog, metalwork turned black, public clocks were obscured by deposit, thousands of fish were strewn on the beach, and sharks came into the surf gasping.

A geologist ascribed this phenomenon to sulphuretted hydrogen produced by bacteria on the sea floor from calcium sulphate or gypsum, the gas accumulating until it raised islands of mud which eventually burst.

Similar discharges occur periodically in this area. They come from a vast stretch of mud 200 miles long and 25 miles wide, lying in the Atlantic Ocean off Walvis Bay, South-West Africa. W. J. Copenhagen isolated sulphate-reducing bacteria from samples of the mud, which contained considerable quantities of sulphide.

World-wide Phenomena

Less striking pollutions of the atmosphere by H_2S occur in other parts of the world. Mr. Butlin instanced the smells which are among the less romantic features of Venice. During a recent visit he had an opportunity of seeing one of the smaller canals being cleaned out. It had obviously been used as a convenient depository for every domestic waste product liable to promote sulphate-reducing bacteria and the bottom was covered with thick black mud (containing much ferrous sulphide) emitting a foetid odour. Samples of water from this and other

Venetian canals gave flourishing enrichment cultures of sulphate-reducing bacteria from which pure cultures have been isolated. One particular sample, odourless when taken, was saturated with H_2S when opened in the laboratory ten days later.

Similar conditions in Holland led to the discovery of sulphate-reducing bacteria by Beijerinck in 1895, their isolation in pure culture by van Delden in 1903, and to most of our early knowledge of these bacteria.

In Britain, as elsewhere, a serious effect of this phenomenon is the action of sulphate reducers in promoting the corrosion of ferrous pipes in clay soils. Much of the trouble caused is avoidable, and what cannot be avoided might be greatly reduced by better methods of control.

Effect on Lead Paint

The Times last year reported extensive damage to paint on the hulls of ships in London docks. "Vessels which arrived looking smart have appeared to be shabby within a few days." The shabby appearance was undoubtedly caused by the action of hydrogen sulphide, produced by sulphate reducers, on lead contained in the paint.

Most of the samples reported to the Chemical Research Laboratory in recent years have related to the nuisances caused by pollution of large pools of water. Sulphate-reducing bacteria are present in practically all soils and waters. Any stagnant body of water of sufficient depth which becomes polluted with substances containing the few simple necessary nutrients for their growth is liable, therefore, to become a crude culture of the organism.

The Chemical Research Laboratory has had opportunities for intimate contact with this problem because the surrounding district is studded with large gravel pits containing from 15 to 20 ft. of water. These are convenient receptacles for the disposal of rubbish by local authorities. Moreover, land is in urgent demand for building purposes and the considerable areas covered by the pits are reclaimed by tipping.

Towards the end of 1947, scientists from the Chemical Research Laboratory inspected two of the pits, each containing about 5 million gall. of water, about which many complaints had been received. Fre-

* Proceedings for the Society of Applied Bacteriology, 1949, Part 2.

quently householders were pestered by offensive smells, paintwork was blackened and copper and silver utensils could not be kept bright. The pools gave off a very perceptible smell of H₂S.

Seen in bulk, the water appeared black; small samples had a light brown colour and smelled strongly of H₂S. Bubbles of gas, presumably methane, were rising in many parts of the pools, being in all probability the result of bacterial decomposition of cellulosic material at the bottom.

Examination of samples in the laboratory confirmed that sulphate reducers were proliferating on a large scale, and it was suggested that the trouble might be cured by acidification. Unfortunately circumstances prevented the experiment from being carried out.

Control of Sulphate Reducers

The next venture a year later was more successful. A stagnant stream which had been greatly contaminated during the war runs behind the grandstand of a race course and obnoxious odours were causing offence. Examination of samples of the water in the laboratory showed large numbers of sulphate reducers. The addition of acid was again advised and this was carried out. Subsequent bacteriological examination showed that the number of sulphate reducers had enormously decreased, and no trouble whatever has since been experienced.

Mr. Butlin has pointed out that, where pollution is known to be inevitable, the rational approach is to prevent or limit the trouble before it starts.

The method of control by depressing the pH to below 5.0 is effective and the best available, but cannot be applied where the water is contained by material—e.g., metals, etc.—which is adversely affected by the low pH. It is possible to remove hydrogen sulphide by chemical methods such as the addition of zinc acetate. This is used to prevent the contamination of coal gas by the comparatively small amounts of H₂S evolved in some gas holder waters, but would be hopelessly uneconomic where large quantities of sulphate and organic materials are continuously renewed. No antiseptic suitable for application on a large scale has yet been found.

There remains the possibility of a biological solution of the problem. One biological method is suggested by the existence of micro-organisms which utilise hydrogen sulphide for growth purposes. Ravich-Sherbo attributes the absence of H₂S in certain layers of the Black Sea to the activities of *Thiobacillus thioparus*, an

aerobic organism which oxidises sulphide to sulphate.

Perhaps the most promising types of organisms for this purpose are the purple and green sulphur bacteria, photosynthetic bacteria which abound in nature and sometimes proliferate in enormous numbers. For maximum development they require hydrogen sulphide, anaerobic or near-anaerobic conditions, and sunlight. All these requirements are satisfied in polluted pools, and it might be possible to create such conditions that hydrogen sulphide produced by the sulphate reducers is consumed as it is produced. The Chemical Research Laboratory is investigating the possibilities of this method of control.

SYNTHETIC MICA EXPERIMENTS

(continued from page 428)

When one considers that those runs which produced fairly solid mica gave cakes six inches or less in thickness it will be realised that we have been able to gain a maximum of four inches of interrupted upward crystal growth.

"If a mica cake of proper chemical composition 1 ft.—preferably 2 ft.—thick were slowly crystallised, it is our belief that some mica of commercial size would be obtained. Probably at best over half the product would be scrap. But a yield of 10 per cent utilisable mica should be acceptable. Some, if not all, of the scrap could be reverted to the process."

A larger hearth, about 6 ft. wide, 3 ft. deep and as long as practicable, would help produce a thicker cake of mica and perhaps better and larger crystallisation. Dr. Aitkenhead also recommends that the raw material mixture be pressed into bricks under high pressure of several tons per square inch. This should compact the material to give a melting shrinkage of 25 per cent, contrasted with 40 to 50 per cent shrinkage when the mixture is tamped by hand.

Synthetic mica has essentially the same properties as natural mics, but is able to withstand much higher temperatures, states the report.

The fact that the U.S.A. has taken a leading position in the attempt to synthesise mica is to be expected, in view of the heavy use which American industries have made of the national material. The U.S.A. is generally considered to be the largest consumer of natural mica. Other countries supplied the U.S.A. with 10,000 tons of mica in 1948 and, apart from the large currency requirement, the possibility of interruption of overseas supplies of a strategic material has introduced fresh urgency into current research.

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GERMANIUM FROM FLUE DUST

Growing Industrial Value of a Rare Element

by A. E. WILLIAMS, PhD., F.C.S.

GERMANIUM was discovered in 1886 by C. Winkler, a Freiburg chemist, who isolated it from the mineral argyrodite, a combination of silver and germanium sulphides, $4\text{Ag}_2\text{S} \cdot \text{GeS}_2$. This rare element is also found in combination with sulphides of iron and copper, as in the mineral germanite, $7\text{CuS} \cdot \text{FeS} \cdot \text{GeS}_2$, which occurs in some parts of South West Africa. It also exists in certain regions of the U.S.A. in association with zinc compounds, and some is recovered during the production of zinc metal. Until quite recently, most supplies of germanium for Great Britain came from the latter source.

It has, however, been known for 20 years that germanium occurs in this country. In 1930 the late Professor V. M. Goldschmidt, an authority on geochemistry, isolated it from samples of Northumbrian coal. Germanium was subsequently found in numerous other coalfields in this country and abroad.

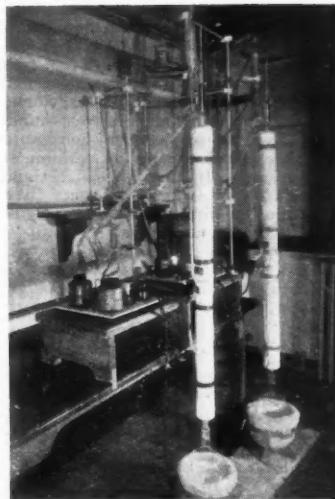
V. M. Ratinski (*Compt. rend. Acad. Sci. U.R.S.S.* 1943, 40, 198) reports that in Caucasian coals germanium is concentrated chiefly in the vitrinite, which is a separable constituent of bright coal and is of vitreous appearance. He reported that the germanium content of the vitrinite ash ranged from 0.1 to 1.0 per cent.

In this country, much work has been done in this sphere by the late Sir Gilbert Morgan, director of the Chemical Research Laboratory. His investigations established that germanium was not evenly distributed throughout the coal, and coal from different mines carried varying proportions of germanium.

In Oxide Form

Further investigations revealed that when coal is burnt in industrial plants much of the germanium—approximately two-thirds—was expelled as volatile sulphide and oxide of germanium. This focused attention on the prospect of recovering germanium from the flues of industrial furnaces, in which the germanium compounds form a deposit.

It was found that flue dust from gas works, for example, may contain up to 0.5 per cent germanium. Such germanium was converted to germanium tetrachloride, GeCl_4 , by treating the dust with hydrochloric acid; the tetrachloride, which boils



By courtesy of G.E.C., Ltd., Wembley
Part of the apparatus used for the distillation of germanium tetrachloride

at about 83°C , was then distilled off. The first distillation was liable to contain some arsenic trichloride, AsCl_3 , since arsenic was invariably present in the dust, but this impurity was eliminated by re-distilling the tetrachloride in a stream of chlorine, using a fractionating column.

During 1945 the research laboratories of the General Electric Company at Wembley became interested in the production of germanium in commercial quantities, and collected samples of flue dust from various gas works, including those of the Gas, Light and Coke Company. Part of the apparatus which G.E.C. used for this distillation is represented in the accompanying photograph.

The samples of dust collected from different gas works contained between 0.5 and 1.0 per cent germanium, while the germanium content of the original coal was estimated to be about .002 per cent.

As the experimental work proceeded, it became obvious that different dusts reacted quite differently to the distillation

technique, as a consequence of which it was rarely possible to obtain a reliable quantitative result. When a relatively high yield was obtained, it was invariably contaminated by other volatile products.

The problem was complicated because some flue dusts were accompanied by a big concentration of a number of other elements, particularly those dusts obtained from the waste heat flues of producers, where considerable proportions of both zinc and arsenic were found. Although these producers were burning coke, under reducing conditions, some of the dust from the producers was found to contain over 1.0 per cent of germanium, while other elements such as gallium were also present. It has been estimated by the late Sir Gilbert Morgan that if only 100 million tons of the coal produced in this country each year contain germanium in the proportions found in samples from various coalfields, about 2000 tons of germanium could be recovered each year as a by-product of coal combustion.

Metallurgical Aspect

In order to achieve success on a commercial scale it was evident that the technique would have to be based more on metallurgical lines than on strictly chemical methods.

At a later stage the G.E.C. research laboratories co-operated with Johnson, Matthey and Co., Ltd., which is now thought to be the principal agency for developing methods for recovering the metal. Long investigation enabled the G.E.C. research laboratories to develop an efficient process for the extraction of crude germanium concentrates. From these they were able to distil crude germanium tetrachloride. Processes have thus been established which produce an economic yield, while the technique employed is more easily controlled on a large scale than earlier methods. At the moment, supplies of high purity germanium metal and germanium dioxide, of British manufacture, are available, and dollar purchases in the U.S.A. have been reduced.

Uses in Electronics

Although germanium has been known so long, it has remained until quite recently little more than a laboratory curiosity. One of the uses for germanium is in electronics in which germanium crystals are of value as semi-conductors.

The interest of the research laboratories of the G.E.C. in producing germanium in appreciable quantities was stimulated by its great value in several devices essential in tele-communications work. As the

wavelengths employed became shorter it was found that the usual thermionic valve was not efficient, so that the old-fashioned crystal technique—using a crystal and “cat's whisker”—was adopted. During the second world war silicon crystals were used in large numbers and the properties of other semi-conductors were studied. Among these, germanium exhibited particular properties which permitted the construction of rectifiers which, with special circuits, could be substituted for the diode type of thermionic valve.

The relatively high price of germanium metal which prevailed earlier probably accounted for the absence of any appreciable amount of research into its metallurgical properties. Now that the metal is available for experimental purposes important applications for it will no doubt be found, such as its use as an alloying agent in other metals.

Some of the fundamental properties of germanium are these: Atomic weight 72.6, melting point 959° C., specific gravity 5.47, hardness (Moh's scale) 6. E. Gebhardt (*Z. Metallk.* 1942, 34, 255) has shown that zinc and germanium form a simple eutecticiferous system with the eutectic at Ge 6 per cent and a temperature of 398° C. He also reports that zinc dissolves less than 0.1 per cent germanium at a temperature of 380° C. H. Westlinning and co-workers (*Z. Electrochem.* 1943, 49, 198) report the solubility of a magnesium-germanium compound, Mg₂Ge, in aluminium at 500° C. as 0.2 mol.-per cent, as determined by X-ray and microscopical examination of quenched samples. They report that the solubility decreases rapidly with falling temperature.

Medical Products of Harwell

DETAILS of the new product of the Harwell atomic pile, Ir192, which, it is thought, may take the place of radium in the treatment of some skin diseases, were presented to medical workers this week at the Scottish Hospitals and Public Health Exhibition, at the McLellan Galleries, Glasgow.

The new isotope is stated to be not only cheaper and more plentiful than radium—it costs £12 to hire one dose for four weeks—but, because the radiation it emits is less powerful than that of radium, it can be used for treating skin disorders without danger of harming the deeper bone structure.

Other atomic products for medical use displayed at the exhibition were isotopes of sodium, used for studying blood circulation, and of iodine.

THE CHEMICAL STRUCTURE OF COAL

New Evidence from the Carnegie Institute

SOME interesting news of work in progress at the Coal Research Laboratory, Carnegie Institute of Technology, Pittsburgh, is given in the current issue of the *Quarterly Gazette*, of the British Coal Utilisation Research Association.

One of the several problems being tackled, states the BCURA, is that of hydrogenation. The objective of the coal hydrogenation programme is to study the constitution of coal by decomposing its substance into less complex constituents under relatively mild conditions. This also provides data important to a better understanding of the processes involved in the production of motor fuels and all other products obtainable by coal hydrogenation.

The conditions under which hydrogenation is achieved (time, temperature, type of coal) are systematically varied and an analysis is carried out as far as possible on the products obtained in the first stages of liquefaction.

The product of the alkaline oxidation of powdered coal, a yellowish powder, is a mixture of aromatic acids, some of which are of the simple benzenoid type like phthalic acids; others are much more complex. The relative thermal instability and colour of the product, however, limit its potential market in the plastics industry. The present phase of laboratory investigations is intended to elucidate the structure of the more complex acids present.

Indene and Benzofuran Ring Systems

Among other results, the fractionation of the hydrocarbons recovered from hydrogenolysis of the butyl esters has indicated the presence of indene and benzofuran types of ring systems. This is the first direct evidence of the presence of structures more complex than the benzene in oxidation products from coal.

The decarboxylation reactions have shown the presence of fluorene which is a 3-ring structure with a 5-membered ring between two benzene rings. Solvent extraction permits the separation of coloured and thermally unstable constituents in the mixture from the benzene carboxylic types. These investigations contribute not only to the development of methods of preparing commercial chemicals from coal, but also to the knowledge of its chemical nature.

Several research projects are studying the properties of the so-called C-O complex

which exists at the interface of the carbonaceous materials and the oxidising atmospheres. One approach is through oxygen transfer measurements in the successive reduction by H₂ or CO and oxidation by CO₂ at 500-700° C. of graphite, coke and other carbonaceous materials.

Use of Radioactive Carbon

Another method aims at determining the rate of oxygen exchange between CO and CO₂ on the carbonaceous surface. Since net effects of such changes are not easy to follow using the usual chemical methods, one of the oxides of carbon is labelled with radioactive carbon C¹⁴. Some workers believe that H₂ and CO can block active sites on the carbon, an opinion which is not universally shared. The retarding role of H₂ and CO in gasification could be attributed to the fact that they could compete with the solid carbon for the oxygen deposited on the surface.

Another approach to the same question of inhibition by H₂ and CO is being investigated by means of adsorption measurements in a circulating system. Fluidised beds have been used to study C-O reactions. Studies of gas flow in fluidised systems, needed for the interpretation of reaction rate data, have incidentally led to a means of estimating coke particle density.

A further research aims at studying the elutriation from a fluidised catalyst bed. Work on the combustion of pulverised coal in self-supporting flame is concerned with the effect of particle size, the air to coal ratio and temperature on the transition from particulate ignition to a flame front.

Welding Research

THE stresses to which a welded structure is subjected through the course of its life was one of the subjects of research shown to the Press at the Abington centre of the British Welding Research Association on September 19. Interest chiefly focused on a new pulsating pressure plant which has recently been installed at the research station to test welded vessels and various materials by repeated applications of pressures. These machines are manufactured by a German firm in Stuttgart and it is claimed that there are only a dozen of them in the world, of which two are in the U.K.

Biological Approach to Rat Poisons

U.S. Adopts Analogue of Dicumural

A NEW poison with a specific toxicity for rats and mice has recently been approved for general sale in the United States. It is a synthetic substance—3-(acetyl-benzyl)-4-hydroxy coumarin, obtained by condensation of 4-hydroxycoumarin with benzaldehyde. First produced in 1942, the poison was known in its early stages of development as "Compound 42" but has recently been given the official generic name of warfarin.

The chemical history of warfarin is exceptionally interesting, for its discovery was the incidental result of an entirely different line of research.

In 1934 there was a considerable amount of sudden and inexplicable death from haemorrhages among cattle in the United States and Canada. Dr. Karl Link, of the University of Wisconsin, traced the haemorrhages to a toxic factor in damaged sweet clover, which was eventually isolated and identified. Its possible use as a clinical agent to prevent post-operative blood clotting and to treat thrombosis was investigated, and it is now considerably used for these purposes under the name of Dicumural.

Extreme Anti-clotting Properties

Large numbers of analogues of this chemical were synthesised in the hope that an even more effective anti-clotting drug could be developed. Among these was Compound 42 or the new warfarin. Numbers of rabbits on which warfarin was tested bled to death when blood samples were later taken, an "excessive" effect not experienced with any of the other anti-clotting substances. This effect was not further investigated at the time because of more urgent war-time problems.

In 1947, however, some of these analogues of Dicumural were re-investigated, using rats and mice as the test animals, and it was again found that Compound 42 was particularly potent as a direct stimulator of haemorrhage. It was found that quite small doses given over a few days were much more toxic than one large dose. Test figures revealed that 100 mg. per kg. body weight were needed to obtain 75 per cent mortality in one dose, while only 7.5 mg. per kg. body weight, consumed over five days, gave 100 per cent mortality.

Further tests showed that it was tasteless and odourless and that there were no warning symptoms from the small doses first developed, and because most rats and

mice keep to the same feeding-grounds, the regular presentation of this poison was not likely to fail in its purpose. Extensive tests, carried out in 1949 in many parts of America, confirmed this assumption. Rats die from internal haemorrhages after consuming several days' doses; there is no external bleeding, though a rat which injured itself within a short time of receiving the poison would probably die sooner by bleeding to death. One figure given for the amount to be incorporated in baits for rats or mice is as low as 1 part in 10,000.

The other important feature of any rodenticide is its toxic hazard to friendly animals and to man. Warfarin enjoys a safety factor in that the toxic dose is directly related to body weight. It is claimed that cats, dogs, or children would have to eat very large amounts of the poisoned bait to suffer ill effects. The general release of the new poison in the United States indicates that warfarin is considered to be safe. Vitamin K is an effective antidote should large amounts be accidentally consumed.

Manufacture of the synthetic substance is covered by U.S. Patents 2,427,578-9, which are owned by the Wisconsin Alumni Research Foundation.

A detailed treatment of this subject has appeared in: *Chemical Industries*, 1949, 65, 1, 31-32.
Ibid., 1950, 67, 2, 232.
Agricultural Chemicals, 1950, 5, 8, 65.

Dollar Exports of Lanolin

BRADFORD Corporation is beginning to earn dollars from its exports to the U.S.A. of the lanolin salvaged from the grease waste from the wool scouring process. Difficulties and delay in obtaining export licences were experienced, and there was an even longer delay in getting the U.S. import permit, partly because lanolin is classified there as a wool grease derivative, which until recently was subject to import control.

The necessary licences were eventually granted and, although Bradford has secured only a comparatively small share of the U.S. market—Germany has been making much heavier shipments, and there are substantial Dutch exports of lanolin to the U.S.A.—substantial and growing quantities are now being shipped.

Technical Publications

EFFICIENT operation of boiler plant largely depends on accurate observation of the many measuring devices now available. Unit instrumentation for small boiler plants is described in an illustrated booklet by George Kent, Ltd. The complete unit records draught at various stages, steam flow, CO₂ and temperature, while the Kent RW/C meter may be used to measure the water feed to a battery of boilers. A typical lay-out and installation notes are also provided.

PRACTICAL use of synthetic rubber has been the subject of a series of 22 ss-circulars containing more than 400 reports on the compounding and processing of synthetic rubber by rubber manufacturers. The final circular (No. 5528) consists of indexes prepared for the Ministry of Supply Advisory Service on Rubber and Plastics by Mr. T. R. Dawson, of the Research Association of British Rubber Manufacturers. The information was issued confidentially under the U.S.-U.K. liaison scheme.

A CHEMICAL treatment which increases the resistance of tinplate to rusting and to staining by sulphur products is reviewed among the recent technical literature of the Tin Research Institute. The Protecta-tin process is preferably carried out on freshly tinned plates, but it is quite practicable to treat filled and sealed cans in order to increase resistance to external rusting.

APPLICATION of high nickel alloys in aircraft construction is given special treatment in "Wiggins Nickel Alloys" (No. 327, published by Henry Wiffin & Co., Ltd., Birmingham). Illustrated articles are devoted to the use of Inconel in aircraft engine exhausts, nickel-iron alloys in fire detector equipment, and thermal de-icing of windscreens, employing nickel-chromium resistance wire.

ACTIVITIES of the Atomic Scientists' Association reported in the president's speech at the annual general meeting in Birmingham are summarised in the August issue of the "Atomic Scientists' News." Articles are devoted to lectures given at a conference on Isotopes in Industry held at Birmingham in May. The first three lectures at this conference were reported in the previous issue.



By courtesy of William Moss & Sons, Ltd.

A mobile alternative to the access ladders required in various forms of chemical plant is the "Beanstalk" which provides platform heights up to 17 ft. by skilful use of tubular frames and a triple hydraulic ram. The manual pump permits full elevation in two minutes, and 45 seconds are required to descend

COBALT, nickel and selenium in pottery are described in a treatise by W. H. Webb, published as a brochure by the Mond Nickel Co., Ltd. Analyses of cobalt oxides and salts are given, with useful lists of references. There are a number of excellent colour reproductions.

THE potential market for aluminium in the canning industry is re-emphasised by the development in Germany of a new type of aluminium container lined with a protective lacquer which enables it to withstand chemical attack by foods. A special characteristic of this container is the sealing arrangements contained in the lid. The design is described, with illustrations, in the August issue of "Aluminium News" (Aluminium Union, Ltd., Montreal, Canada).



The Chemist's Bookshelf

STRUCTURE OF MOLECULES AND THE CHEMICAL BOND. Y. K. Syrkin and M. E. Dyatkina. Translated and revised by M. A. Partridge and D. O. Jordan. Butterworth Scientific Publications, 1950. Pp. x + 509. 63s.

Latterly, the inorganic chemist has reached a proper realisation that structural studies are as important in the inorganic field as for years they have been recognised to be in the organic field. There is, therefore, an increasing tendency to discuss simultaneously, with no suggestion of dissimilarity, matters of bonds and reaction mechanics as applied both to organic and inorganic substances. This development has considerable advantages, particularly perhaps for the inorganic chemist, though it is clear that benefits are to be derived on both sides.

Both theoretically and experimentally there have been many recent advances in our ideas of structural chemistry, right from the conception of atomic orbitals up to the structure of complex molecules. The development of wave mechanics, for example, has permitted an increased understanding of such subjects as the forces between atoms in molecules, while the wide application of physical methods to structural investigation has enabled the theoretical deductions to be tested practically, and in many cases to be extended or modified.

The Russian authors of this book, which was first published in 1946, have aimed at presenting a coherent account of the field which discusses both theoretical and practical aspects as an integrated whole. The translators have, in addition to their basic task, modified and revised the content in the light of later developments, so as to give an up-to-date survey of a difficult but a highly important aspect of modern chemistry. Starting from the classical and semi-classical views of the structure of the atom, brief but adequate discussion is given to the development of wave mechanic concepts as applied to simple atomic structure, and the relation of this to the periodic classification as a whole. This is followed by an account of the development of ideas on the chemical bond, with particular reference to

covalency and resonance, and leads directly to discussion of the relation between electrovalent and covalent binding, and the existence of intermediate bonds.

Up to this point the Heitler-London atomic orbital method has served as an adequate basis for the treatment. The molecular orbital method is now introduced, and is considered in its application to diatomic and polyatomic molecules, always correlating, as far as possible, the results of theory with practical physical measurements. Several chapters are devoted to such important problems as spectral measurements, dipole moments, bond energies and intermolecular forces. A consideration of the structure of crystals follows logically on the last of these. There is next a considerable chapter on the structure of complex compounds, and a smaller chapter on the controversial boron hydrides. The three final chapters are concerned with more advanced mathematical treatments of polyelectron and related problems, and derivations for the material discussed earlier in the book.

Although the book is not easy reading, and requires for its full understanding considerable mathematical knowledge, all that is possible has been done to present the information as simply as is compatible with a reasonably full treatment. The non-mathematical reader will therefore gain a considerable insight into the present state of our knowledge of this subject if he is content to skip those parts, usually conveniently segregated, which are beyond his abilities, and to accept the derivations arrived at in the book. Quite a large proportion of the five hundred pages are readily intelligible to anyone with an average chemical background. In turn, the mathematical reader will find collected under one cover a useful survey of a field in which much of the information has hitherto been rather widely scattered.—C.L.W.

MR. WILLIAM H. TROTTER has been appointed to handle the sales promotional activities of the Chemical Division of Celanese Corporation of America. His experience includes service with the chemistry departments of the University of Maryland and the U.S. Bureau of Standards.

OVERSEAS CHEMISTRY AND INDUSTRY**U.S. MINERAL AND METAL PRODUCTION****Higher Levels of Some Strategic Materials**

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PRODUCTION of native sulphur in the U.S.A. in June totalled 487,845 long tons, according to reports of producers to the Bureau of Mines, U.S. Department of the Interior. This was the highest figure achieved for any single month and brought the total for the first half of 1950 to a record of 2,543,448 long tons, compared with 2,388,473 for the same period of 1949.

Apparent sales of sulphur were calculated at 407,405 long tons, which was 8,641 long tons more than June last year, but 77,690 long tons less than in May, 1950. Producers' stocks at 2,956,338 long tons were 80,440 long tons better than the previous month, and showed the first improvement for a long time.

Aluminium and Bauxite

Primary aluminium production in the U.S.A. in June reached a total of 60,400 short tons. Although this showed a two per cent decline because of the shorter month, the average daily rate of output established a peace-time record. The basic price remained unchanged throughout the

month. Stocks at the end of the period were 14,500 short tons, compared with 16,341 short tons in May. Net imports decreased 35 per cent to 9251 tons, as receipts from Canada declined for the third successive month. Imports of semi-crude aluminium from the U.K. were also lower.

The greatest production of bauxite for a three-month period since 1948 was attained in the second quarter of 1950 with a total of 359,938 long tons (dried equivalent).

Despite a decline from Surinam, the largest foreign source, imports in the period April-June were marked by an increase over the same period of 1949 and were also higher than the first quarter of this year. Receipts from both Indonesia and British Guiana gained, the former reaching the high level of 184,728 long tons, compared with 167,890 long tons in April to June 1949, and 114,241 long tons in January to March, 1950. Exports to Canada totalled 7566 long tons, a decrease of five tons per cent.

New Brazilian Sources of Fuel and Chemicals

BECAUSE the international situation may curtain supplies of fuel before Brazil can develop her own natural petroleum sources, the Security Council has recommended the development of the abundant national reserves of bituminous schists. The refinery at Cubatão, near Santos, which was to begin processing 45,000 barrels daily of imported crude oil in 1953, may be used to produce shale oil from the impregnated schists of the Paraíba Valley, where the geological formation known as the black Iriti schists extends for hundreds of miles. The layers vary in thickness from 100 to 200 ft., and favourable conditions for commercial exploitation exist at many points.

Besides oil, the distillation of shale yields gas of high calorific power, for domestic and industrial purposes and in the production of synthetic ammonia and ammonium sulphate. Another product is a powerful insecticide, now used industrially in Brazil, while the final residue of the shale, in powder form, is also employed as an insecticide. This residue also serves to

filter and deodorise vegetable and mineral oils, purify polluted water and fill plastic materials. Used as pozzolana it improves the quality of Portland cement.

A private company, with a capital of £320,000, is already extracting oil from the bituminous schists at Pindamonhangaba, in São Paulo. The first retort has been brought into service and three others will begin operating this year, giving an initial output of 8000 litres of crude oil. The company will use part of the gas produced as fuel. The surplus, amounting to about 300 cubic metres per 1000 kilos of oil, will be marketed.

Another company has been exploiting a small part of the Tremembé-Taubaté deposits in the Paraíba Valley for some years and modern plant has now been acquired to produce 3300 gallons of fuel oil daily. The beds worked by the company are capable of yielding 20,000 barrels daily for many years. Samples analysed by the U.S. Bureau of Mines yielded 36.5 gallons of petroleum per ton, or 6.5 gallons more than the famous Colorado schists.

European Fertiliser Programmes

Russian Claim for a Potent Bacterial Method

THE Russians are said to be using this year a new fertiliser stimulant called Nitragin, containing root bacteria which aid the plant to assimilate atmospheric nitrogen. According to one Soviet source, about 1.5 litres per hectare would be capable of doubling some crop yields. Some 1½ million hectares are being treated with the new preparation this year. The possibility cannot be excluded that litres is a misprint for some larger unit). In addition to use of K, N, P. and Ca fertilisers, on certain experimental areas, some crops are being treated with compounds of other elements in increasing amounts, such as those of B and Mn, for beet, and of Cu for peat and grassland.

The significance of trace elements, to which so much attention has been directed in recent years, has not been ignored in Russia. Numerous compounds in very small amounts are being tested, such as those of Mo, Co, I, Mn, Cu, Zn.

It is planned this year to produce 5.1 million tons of N, K and P fertilisers in roughly the following proportions: N 1.3 million tons; K 1.1 million tons; and P 2.7 million tons. These are estimates: actual outputs may be larger. Export trade is being developed both in potash and nitrogenous fertilisers.

Italian Production

Production of superphosphates in Italy in 1949 was 1.4 million tons, representing a considerable increase over preceding years, although still below the capacity of reconstructed works (1.8 million tons). A substantial amount was exported. Crude phosphate was imported from N. Africa (725,000 tons) and the balance of about 100,000 tons from the U.S.A. and Egypt. Total exports of fertilisers from Italy in 1949 were 268,290 tons, compared with 124,254 tons in 1948.

Austria

The nitrogen fertiliser factory at Linz, Austria, with an output in March of 30,000 tons, reached its maximum level of production of calcium-ammonium nitrate. The total production of this in 1949 was 288,000 tons. Exports in the first quarter of 1950 amounted to 140,000 tons, and exceeded production, the principal customers being Poland, Spain, Czechoslovakia, Yugoslavia, and Holland. For the season 1949-50, several export agreements were estab-

lished for nitrogenous fertiliser supply, largely in the form of barter or compensatory arrangements. The home demand this year for calcium-ammonium nitrate is estimated at about 85,000 tons.

French Output

For the first four months of 1950 fertiliser production in France was as follows (in 1000 tons):—

	Jan.	Feb.	Mar.	Apr.
Superphosphate	109.5	96.2	92.2	80.0
Synthetic N (in terms of N)		19.2	17.0	15.4

These figures represent a decline in the monthly average of superphosphate which was 100,000 tons in 1949, 140,000 tons in 1948, and 114,000 tons in 1938. The monthly average for synthetic nitrogen has risen somewhat.

Belgium's production of nitrogenous fertiliser in 1949 was 167,200 tons as against 156,722 tons in 1948 (reckoned in N). It is expected that in 1950 the production will maintain last year's level or a little higher.

East German Efforts

Last year's export from East Germany of 28,000 tons of nitrogen to China is to be approximately doubled this season. An agreement between the Soviet Union and Communist China provides for supply of N fertiliser from Russia, of which about 200,000 tons per annum is required.

Sweden

Superphosphate production by the three largest works in Sweden in 1949 was 436,500 tons. Crude phosphate was imported from U.S.A. and Russia.

U.S. Potash Output Increasing

POTASH deliveries during the second quarter of 1950 in North America by the five major U.S. producers and three importers totalled 693,247 tons of potash salts containing 392,687 tons of K₂O. This is stated to have constituted a record high level. The figures represent an increase of 16 per cent in salts and 21 per cent in K₂O over the tonnage delivered during the corresponding period of 1949. Imports comprised 57,044 tons K₂O of the totals quoted.

NEW PLANT AND PRODUCTS IN S. AFRICA

Chemical Factories Under Construction

From OUR CAPE TOWN CORRESPONDENT

THE new factory being built by General Chemical Corporation at Industria, Johannesburg, is to occupy five acres of the company's 40-acre site. It is expected to be completed by November. The factory will be equipped with modern mechanised methods of chemical production, filling, packing, etc., and the building and grounds will cost nearly £100,000. Production is to include about 150 general chemical products such as adhesives, cleansers, disinfectants, insecticides, waterproofing compounds and lubricants. This firm is making Izal under licence from Newton, Chambers, & Co. It has another factory in Natal. It is planned to develop the rest of the Johannesburg site as an industrial township.

* * *

The Texmaco Supply Co., 514 Maritime House, Loveday Street, Johannesburg, is to form a local company with an initial capital of £10,000 for the production of textile chemicals under licence from the Swiss company Erba. Production may begin early in 1951. The factory will be erected on the Rand and is intended to produce a wide range of chemicals, including those for the cotton preparing and finishing processes, sizing and desizing, starching and bleaching, for the impasting of dyes, for equalising and after-treatment and soaping. A preparation will be made for impregnating raincoats, and others for application to wool and for a number of other textile purposes. This will be a specialised industry of a type new to South Africa and it is expected that some overseas capital will be invested in the project. A chemical fireproofing substance for textiles, among the new products, is likely to find fairly widespread acceptance.

* * *

Foamed resin as an adhesive, primarily intended for the plywood industry, is in active manufacture at East London by a firm specialising in the production of synthetic resins, emulsions, etc., for various industries. This firm lately added to its range three new types of adhesives, never before made in the Union. Two of these have special water-resisting properties and are intended mainly for the production of waterproof plywoods, although

they can be used equally well where any water-resistant bond is required. The third type is designed for the bonding and joining of all woods and may be used equally well for paper, leather, cork and almost any porous material, the makers state. When mixed with natural glues, it is stated to confer improved adhesion and water-resistance, but, unlike the natural products, is not attacked by mould or fungus.

* * *

Brooklyn Laboratories (Pty.), Ltd., Wren Street, Brooklyn, Cape Town, is making copper naphthenates for the treatment of timber against boring and other insects, and zinc naphthenates as rot preventives and to guard against fungus, mildew, etc. It is hoped that considerable quantities of the copper naphthenate will be sold to the local fishing industry as it has been approved by research scientists for the impregnation of fishing nets. It is claimed that the metallic chemicals made by this company are non-leaching, readily soluble in mineral spirits and have deep penetration. The company is also making anti-fouling copper paints, waterproof, anti-corrosive sealer paints, and similar compounds. Apart from the electric motors, most of the machinery used in this factory was designed by the company's directors and made in Cape Town.

* * *

Chromium oxide (chrome green) and zinc chromates have been added to the regular output of pigments by a well-known firm of chemical manufacturers at Germiston. The former is needed by a number of local industries. The zinc chromates are being made to stringent specification for use as rust inhibitors and to provide protective coatings.

* * *

A further increase in profits to £88,764 is shown in the accounts of National Chemical Products, Ltd., whose sales in 12 months rose by £107,600 to £810,600. The directors state that profits would have increased more if supplies of molasses had not been severely restricted in the last months of the financial year owing to insufficient rainfall in the sugar-cane area during the preceding season.

French and Belgian Rubber Research

Current Activity of the Specialist Institutes

THE view that synthetic rubber was a misnomer, since the chemical structure of the synthetic was quite different from that of the natural product, was expressed in a paper concerned with the recent publication (1950) in Paris entitled "Les Dérivés Chimiques du Caoutchouc Naturel." The authors of the latter were Dr. J. le Bras, inspector general of the Institut Français du Caoutchouc and of the Institut des Recherches sur le Caoutchouc en Indochine, and M. Pignoli.

In his commentary at the Belgian Rubber Congress at Brussels recently, Dr. le Bras called attention to the authors' conclusion that it would be more logical to speak of "artificial rubber." In some quarters, in fact, "chemical rubber" was finding favour as the correct designation.

The question of the probable future of natural and artificial rubber could not ignore their mutually complementary attributes rather than their sharply competitive aspects. Dr. le Bras thought there was certainly room for both in view of the rapidly expanding and widely varying needs of industry and science.

Work on High Polymers

The congress is reported in *L'Ind. Chim. Belge*, 1950, 15, 4, 219-232, which also gives a summary of a paper by Mr. J. T. Fitzgerald, of the Polymer Corporation, Ltd. (Canada), on high polymer progress.

Mr. Fitzgerald described the works of his company at Sarnia (Ontario), its research organisation, and the evolution of its principal products, notably butyl polymers and the Polysar-S range. Research and development there, he said, comprised six sections: polymerisation, physical research, a pilot plant for rubber of the Polysar-S type, mixing technique, specifications and standards, and butyl research. It was at Sarnia, he claimed, that the first success was achieved in polymerising butadiene with acrylonitrile in a GR-S plant, in which low temperature was an important factor.

Special attention had been given to low temperature resisting rubber of butadienestyrene base, which would withstand temperatures of -62° or even lower; in the Gehman test it hardened completely only at -73°C . The value of lignine as a stabilising and strengthening agent was also emphasised by Mr. Fitzgerald.

M. Reichert, discussing the ISO (International Standards Organisation), with

particular reference to the work of the Comité Technique No. 45, dealing with rubber standards, complained that Belgium so far had contributed nothing to the work and proceedings of the ISO or Comité 45. That was hard to account for, in view of the country's extensive rubber plantations in the Congo and the considerable rubber industry in Belgium.

French Research

In reply to a series of questions by M. A. R. Matthys, president of the Association Belge des Techniciens du Caoutchouc, which organised the congress, Dr. le Bras gave some information on the history, organisation and programmes of the two institutes of which he is scientific director-general, the one in Paris and the other in Indo-China, both under the same governing council. L'Institut Français du Caoutchouc had three departments—of documentation, research, and application. The research centre undertook a varied programme both in chemistry and physics, and also organised courses of instruction for young specialist engineers.

The Centre d'Application had the task of extending the uses of rubber in every possible way, working in close touch with the research department, and its work included a considerable amount of technical and scientific publicity. The institute in Indo-China was chiefly concerned with rubber cultivation problems.

Valuable progress had been made in Indo-China in conjunction with the planters, both with natural rubber and the vulcanised products.

Plant Source of New Antibiotic

A NEW antibiotic, said to have shown high potency as a fungicide, has been isolated in the Vermont Agricultural Experimental Station, U.S.A., by Dr. John Little, head of the department of agricultural biochemistry. The compound, tentatively called Plumericin, from the name of the source, *Plumeria multiflora*, has shown some activity in the laboratory against certain bacteria, including one strain of tuberculosus organism.

Plumericin, which is novel in the antibiotic field in that it comes from a plant, was found in the course of an intensive search for new medicines from tropical plants. More than 1700 plants would be tested.

OVERSEAS

Spanish Firm's New Medical Products

Production of a number of new medical supplies such as special local anaesthetics, an anti-malarials, other than quinine, and penicillin pills has been started by Azamón, a Spanish firm affiliated to I.C.I., Ltd.

New Zealand Coal De-Nationalised

A Bill to restore unworked coal in New Zealand to private ownership was introduced last week by the Conservative Premier, Mr. Sidney Holland. Royalty mortgages, coal leases and other contracts cancelled by the 1948 Act of the Labour Government will be re-instated. All money received by the Crown will be refunded to the owners.

Australian Metal Prices

Prices of domestic lead and zinc were raised in Australia this week to £65 a ton for each metal, which represented increases of £30 for lead and £25 for zinc. World prices for these metals in Australian currency are equivalent to £160 a ton for lead, and £175 a ton for zinc. The marked disparity between overseas and Australian prices has long been the subject of protests by the producers.

Mounting Output of U.S. Chemical Industry

The chemical industry has shown the highest growth rate of any major section of the United States economy, according to Dr. Raymond H. Ewell, manager, Chemical-Economic Service of the Stanford Research Institute. Chemical industry in America has grown from an output worth \$600 million a year in 1925 to \$5000 million a year in 1949. This rate of growth is three times as high as the average of all United States industry.

U.S. Chemical Engineering Studies

The University of Wisconsin chemical engineering department provided three papers for the regional meeting of the American Institute of Chemical Engineers, held recently in Minneapolis. They dealt with the subjects of catalytic oxidation of nitric oxide, reporting a step in a recent process for converting nitrogen from the air into fertiliser, by H. N. Wong, Ralph Baker, and Professor O. A. Hougen; vapour phase catalytic esterification, by R. A. Buckley and Professor R. J. Altpeter; and freeze drying with radiant energy. The last, by W. H. Zamzow and Professor W. R. Marshall, was a valuable study of drying heat-sensitive materials such as plasma, antibiotics, and food.

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U.S. Aid for French Oil Refinery

France is to receive assistance from the Economic Co-operation Administration towards the rebuilding of the oil refinery at Dunkirk. The total of the grant from ECA will be \$4,005,000 (£1,430,000), sufficient to cover all dollar costs. Total cost of the reconstruction is estimated at £18 million.

Colombian Caustic Soda Plant Opens

The new caustic soda plant near Bogotá, Colombia, financed by the Banco de la República, was officially opened at the beginning of August. It is likely that production will start in six months' time and the daily output is then expected to be 55 tons of soda ash, 25 tons of caustic soda, 4 tons of bicarbonate of soda and 200 tons of refined salt.

Labelling Goods for Ecuador

A decree issued by the Ecuadorean Government prohibits the import into that country of pharmaceutical, antibiotic and some other specialised products which are not individually labelled and provided with literature printed in Spanish. These may, however, also have texts written in any other language. An exception may be made for products imported by medical and similar bodies.

Peru's Prospective Cellulose Industry

A delegation from the Peruvian Amazon Corporation is visiting Rome with the object of founding a national cellulose industry in Peru. The delegates have carried out experiments with experts from the Italian cellulose industry, using wood from the Amazon forests. The pulp produced is believed to furnish an excellent quality of cellulose, well suited for the manufacture of newsprint. The mission hopes to obtain Italian specialised labour and financial participation.

Japanese Titanium Dioxide

Japan is soon to start the manufacture of titanium dioxide. According to SCAP's Economic and Scientific Section, the Nippon Titanium Company has been formed for this purpose under joint American and Japanese sponsorship. Both American and Japanese capital will be invested in the new venture and the company is expected to be in full operation by January, 1951. Japanese indigenous iron ore and a patented process developed by Dr. Kyozo Ariyama, a graduate of the University of Minnesota, U.S.A., will be used.

PERSONAL

MR. MARK H. HEYWOOD has joined the board of P. B. Cow & Co., Ltd., as technical director. He has an international reputation as a rubber technologist, with over 30 years' experience in the industry. For the past 20 years he has been chief chemist to the English Firestone organisation. He is a member of many professional institutions, and is a Fellow of the Royal Institute of Chemistry and the Institution of the Rubber Industry. Among his many appointments he has served as a representative on the Parliamentary and Scientific Committee. In 1944 he was one of the team responsible for the conversion of the French tyre industry to the use of

MRS. M. K. SCHWITZER, of Bamag, Ltd., the chemical, gas and oil engineers, has returned from a visit to Iran where he studied problems arising out of the progressing industrialisation of the country. At the request of vegetable oil interests he spent also some time in Turkey and in other Mediterranean countries. The continued high prices which vegetable oils command in the world market and the increased home demands for high quality products are enforcing substantial changes in the vegetable oil processing technique.

At the opening of the international congress to combat tuberculosis in Rome, 500 doctors representing 48 countries presented a gold medal to SIR ALEXANDER FLEMING, the British discoverer of penicillin. The congress was convened by the American College of Chest Physicians.

MRS. H. A. R. BINNEY, an Under Secretary of the Board of Trade, has been appointed deputy director of the British Standards Institution.

Davey, Paxman & Co., Ltd., the Colchester engineers, announce that MR. J. P. ELLIOTT, secretary and chief accountant of the company, has been appointed a director of the company.

MRS. DAVID OWEN HUGHES, of Gwenllys, Llangefni, Anglesey, at one time on the agricultural chemistry staff at Bangor University, left £5575 (£5454 net).

MRS. T. MAY-SMITH, 9 Spareleaze Hill, Loughton, Essex, retired manufacturing chemist, and former director of A. Boake, Roberts & Co., Ltd., left £31,785.

LT.-COLONEL SIR WILLIAM WAYLAND, lately chairman of W. A. Wayland & Co., Ltd., manufacturing chemists, of Deptford, left £53,662.

NEXT WEEK'S EVENTS

MONDAY, SEPTEMBER 25

Institution of the Rubber Industry

Manchester: The Engineers' Club, Albert Square. 6.15 p.m. "Safety and Accident Prevention in the Rubber Industry" by R. W. Lunn.

The Faraday Society

Cambridge: The University. General discussion on "Spectroscopy and Molecular Structure—Optical Methods of Investigating Cell Structure." Until September 28.

TUESDAY, SEPTEMBER 26

Society of Chemical Industry

London: Waldorf Hotel, Aldwych, W.C.2. 6.30 p.m. "The Chemical Industry and Plastics" by Dr. R. G. Heyes (chairman of the London section of the Plastics Institute).

THURSDAY, SEPTEMBER 28

Society of Chemical Industry

London: Burlington House, W.I. 6.30 p.m. "Elastic and Viscous Properties of Polystyrene in Solid and Liquid States" by Dr. H. W. Mohrman. British Rheologists' Club invited.

Laundry, Dry Cleaning and Allied Trades

London: Grand Hall, Olympia. Exhibition. Until October 7.

FRIDAY, SEPTEMBER 29

Society of Chemical Industry (Food Group)

London: Marks & Spencer, Ltd., Paddington Street, W.I. 6 p.m. Fourth Conversazione. Until 10 p.m.

OCCA (Manchester Section)

Manchester: Cheetham Town Hall. 6 p.m. First Post-Graduate Lecture: "Topics in Colloid Chemistry" by Dr. A. S. C. Lawrence.

Royal Statistical Society

Sheffield: The University. Conference on "Scientific Method in Industrial Production." Until October 1.

Danish Chemists' Visit

The Food Group of the Society of Chemical Industry has made arrangements for a small party of Danish chemists who will be staying in this country from September 24–October 2, to visit food factories and other places of interest. Members of the Food Group will have an opportunity of meeting members of the party at the conversazione to be held at Marks and Spencers, Ltd., Paddington Street, W.I., on September 29.

• HOME •

Tar Distillers' Extension

Scottish Tar Distillers, Ltd., of Falkirk, is to undertake extensions at Camelon at a cost of £8145.

KID Exemptions

The following chemical materials have been exempted from Key Industry Duty for the period beginning September 11 and ending December 31: *p*-nitrotoluene, *o*-anisidine, mono chloroacetic acid, diethylamine, ethylenediamine hydrate.

£100 for RAF Charities

Staff and workers at the Ardeer factory of I.C.I., Ltd. (Nobel Division) at Stevenston, Ayrshire, have sent £20 to the RAF Benevolent Fund. This brings to £100 the total amount received by the RAF Benevolent Fund from this source during the past year.

Metal Prices Raised

Cadmium prices were advanced on September 18, from 15s. 6d. to 17s. 3d. per lb. delivered. An increase was also recorded in wolfram ore, which was quoted in London nominally at 220s. to 225s. per unit e.i.f., compared with 215s. to 225s. on September 13.

Scientific Photographs at RPS Exhibition

Among the entries for the Royal Photographic Society's 95th annual exhibition was a photographic method of examining wear in precision bearings and some interesting radiographs of an avometer and a steel plate taken with 2 million volt X-rays. Also on view were some examples of the use of photomicrography in the examination of living tissues. One of three sub-standard colour films shown by the society is devoted to corrosion and heat-resisting steels.

Fluctuating Tin Prices

Prices of tin varied considerably during the week. On September 13 prices dropped by as much as £30 but rallied later. The net falls were then about £12 for spot and £6 for forward purchases and the price closed at £775. On September 15, after a weak opening, there was a rally, and business (in three months) was at £784. On September 18 prices on the London Metal Exchange fell about £26 a ton, though cash tin at £760 at the close, was £4 higher than at the end of the opening session.

OCCA Jubilee

The Manchester section of the Oil and Colour Chemists' Association celebrated its silver jubilee with a dinner and dance, held in Manchester on October 20.

Import Duty Exemption

Ferro-silico-chromium containing not less than 20 per cent of silicon and 10 per cent of chromium is exempted from import duty under the Import Duties (Exemptions) (No. 9) Order, which came into operation on September 21.

Electric Motor Prices Reduced

Increased volume of production and improved methods are credited with having enabled Newman Industries, Ltd., Yate, Bristol, to reduce home and export prices of some larger electric motors, in some instances by nearly 10 per cent.

Coal Output

Deep-mined coal production last week rose by 2000 tons, although the total output showed a slight decrease over the previous week. Comparative figures are:—Last week: 4,206,700 tons (deep-mined 3,972,600 tons, opencast 234,100 tons). Previous week: 4,208,200 tons (deep-mined 3,970,600 tons, opencast 237,500 tons).

Steel Production in August

Output of steel in August was at an annual rate of 14.53 million tons, which compares with a rate of 14.367 million tons in July. During the first eight months of 1950 the annual rate has been 16.063 million tons; the target set for the year is 15½ to 16 million tons. Production of pig iron was at an annual rate of 9.205 million tons, against 9.099 million tons in the month of July.

Developing Refinery Programme

Work is now well in hand on the second distillation unit and the catalytic cracking plant of the new refinery at Stanlow which are due for completion next year, reports the *Shell Magazine*. At Shell Haven the cooling water pumphouse, which takes water from the Thames, will be finished in a few weeks' time, while work on the 6000 tons-per-day distillation unit is well advanced. The boiler plant, doctor treater and other facilities are nearing the completion stage, and refining operations are due to start in two months' time.

Company Meeting**THE DISTILLERS CO., LTD.****Good Progress in Home and Export Markets**

THE 73rd annual general meeting of the company was held in the North British Station Hotel, Edinburgh, on Friday, September 15, 1950, when the chairman, Mr. H. J. Ross, presided.

The chairman said: As usual, I propose to preface my statement with a reference to changes in the constitution of the board which have taken place in the course of the past year, or which are immediately imminent. The report lists the names of three new directors who have been appointed since the last annual general meeting, and you will be asked to give your approval of these appointments later in these proceedings.

Apart from Mr. Connell, who retires by rotation but who does not seek re-election, two other directors—Mr. Adams and Mr. Comery—are due to retire from active business at the end of the present month in accordance with the provisions of the company's superannuation scheme.

You will observe from the report that these two gentlemen are to retain their directorships for a period, during which they will act in a consultative capacity. As this is a departure from the company's established practice, a word of explanation is necessary. I think it is generally known that the majority of the company's directors are wholetime working executives, and, as such, are due to retire at age 65 in terms of the superannuation scheme. It is felt that, with a life-time's experience of our activities behind them, they can still be of great value to the company, and the intention is to retain them as directors without executive duties for a period of three more years, during which time they will attend the regular meetings of the board.

Trading Profits

The statement of accounts discloses that the manufacturing and trading profits of the company and its subsidiaries for the year ended March 31, 1950, amounted to £12,887,691. This is a record for the company and compares with £10,361,857 for the previous year. To the profit is added income from investments and other sundry items, making a total revenue of £14,082,826. Taxation requires £6,421,948, and after making provisions for depreciation, writings off, and allowance for

interest of outside shareholders of subsidiary companies, the net profit attributable to the group is £5,930,557 as against a corresponding figure in the previous year of £4,756,628.

The revenue reserves of subsidiary companies have been strengthened by the transfers thereto of £1,222,814 while the board has agreed to appropriate £512,923 to general revenue reserve in the books of the parent company. At the same time the directors agreed to appropriate £100,000 from the investment reserve and to use it in reducing the book values of certain investments in subsidiary companies.

The balance available is £4,294,820 and, after providing for the dividends distributed or recommended, the carry-forwards are increased by £1,742,955, making them £5,986,353.

Dividends

It may be noted that of the net profit attributable to the group—that is after taxation and all charges—42 per cent was earmarked to stockholders by way of dividends and 58 per cent was ploughed back into the business by way of reserves or increased amounts carried forward. In considering this policy the board had due regard to all relevant factors and particularly that of restraint in declaration of dividend and the necessity of conserving cash resources to meet commitments for capital expenditure, etc. On May 4, 1948, to save any misunderstanding, the board announced that 28 4/7 per cent was the standard by which a policy of dividend restraint should be measured. Since that date the issued capital has been increased and the equivalent rate works out at slightly over 19 per cent. For the year to March 31, 1949, the dividend rate based on the new capital was 18 1/3 per cent.

In all the circumstances the board decided that the correct course was to recommend a final dividend on the ordinary stock of 7 1/5d. per 4s. unit, which with the interim dividend already paid, made 9 3/5d. per unit for the year, equivalent to 20 per cent, all less income tax. The increase in the amount actually distributed is £206,606.

In view of the small increase granted to the ordinary stockholders, and to mark its

appreciation of the services of the works and office staffs in making possible the record level of profits, particularly from desirable export markets, the board decided to grant an export incentive bonus to all employees having six months' service in the group and in active employment at the date of payment. This will be at the rate of $2\frac{1}{2}$ per cent of salary or annual equivalent of normal weekly wage and is additional to the monetary bonus of $7\frac{1}{2}$ per cent previously granted to the staffs. The board believes that the stockholders will give full endorsement to this decision.

Production Costs

The profits of the group increased by nearly £2.5 million and it is desirable to make reference to two factors which played a part in this result. Firstly, in September, 1949, immediately following the announcement of devaluation of sterling, the company, in accordance with the Government's wishes, adjusted the sterling prices of Scotch whisky exports to the U.S.A., Canada and certain other markets. These adjusted prices brought additional revenue to the blending companies and are still in operation. It must be remembered, however, that, as an offset, costs of production and of selling have risen quite substantially. Secondly, the group received a satisfactory and encouraging return from part of the expansion scheme, although it will be some time yet before the full benefits are available.

The legal balance sheet of the company calls for the following comments:—

(1) The issued ordinary stock of the company shows the increase brought about by the capitalisation of £7,512,923 of the revenue reserves and the appropriation of this to the ordinary stockholders by the allotment of £1 of stock for every £2 held.

(2) Investments in subsidiary companies and trade investments both show substantial increases since the previous report, and these reflect further payments in connection with the expansion programme. As a consequence the net liquid assets of the company show a reduction.

In the consolidated balance sheet it will be noticed that the amount of fixed assets is higher by a little over £2.5 million due to the development of the expansion programme. Current assets also show a substantial increase, while current liabilities remain much the same as in the previous balance sheet. While the issue of new ordinary stock during the year required the capitalisation of £7,512,923 of available reserves, the total of reserves and surplus at March 31, 1950, at £29,063,463 is only £3,372,453 less than at the previous balance.

Issued share capital and reserves are over £4 million higher, representing the increased strength of the organisation.

The board when agreeing to undertake the expansion programme gave very careful consideration to the eventual costs. Since then, however, factors have arisen to cause amendment to these figures. These are:—

(1) The costs of the programme are proving to be in excess of the estimates.

(2) As development has progressed certain additional and costly extensions have proved necessary.

(3) The additional working capital required to finance the holding of stocks at increased values and the replacement of plant and machinery.

(4) The essential allocations for taxation, particularly for profits tax, have been substantially above the estimated amounts taken into account.

In addition, it has now been agreed by the board to extend and to modernise the blending and bottling plants of certain of the large subsidiary companies.

As a consequence the company considered it advisable to make application to the Treasury for permission to borrow £10 million by way of unsecured loan stock for a limited period with repayment starting at an early date. The necessary consent has been granted.

It has been decided to borrow the money from certain corporate investors. The stock is divided into two serials. The first, £4 million $3\frac{1}{2}$ per cent stock serial, issued at par, to be repaid by four annual instalments of £1 million starting in 1952 and finishing in 1955. The second, £6 million $3\frac{1}{2}/16$ per cent stock serial, issued at par, to be repaid in four annual instalments of £1 million starting in 1956, with a final one of £2 million in 1960. It is expected that the money will be available to the company on September 20, 1950.

Taxation

In connection with the increase in taxation to which reference has been made, it is appropriate to mention that in the past two years the total cost of taxation to the group has been a little under £12 million. Taxation at the present high level is causing considerable anxiety to those responsible for the carrying on of industry, as it is proving a severe drain on the resources of the companies concerned, reducing the amounts they have available for renewals of plant and machinery, the carrying of additional desirable stocks and the development of new projects.

As forecast to stockholders at the previous annual meeting a pension scheme has been established by an agreement and deed

of trust under which the company and certain of its subsidiaries will contribute sums to secure continued payment of pensions existing at April 1, 1950. These companies will also provide for payment in due course of pensions to present and future employees, their widows and dependants. This scheme has received the approval of the Inland Revenue authorities. It is satisfactory that the actuary to the scheme has reported that the superannuation and provident reserves of the group are in the aggregate more than sufficient to cover the amounts required at March 31, 1950.

During the year under review the company's malt and grain distilleries secured good outputs, and these enabled the blending companies to make very welcome additions to their stocks of maturing whiskies for use in the years to come.

For two successive years reference has been made to the very meagre allocation of Scotch whisky available to the home consumer, but on this occasion I am able to report some modest degree of improvement in this respect. Releases for the home market may be increased from 2 million to 2.6 million proof gallons. This relaxation on the part of the Ministry was accompanied, however, by a demand for a similar increase of 600,000 proof gallons in the volume of exports.

Home Trade

Under last year's arrangement with the Ministry of Food the releases for home trade consumption were pegged at 2 million proof gallons for the industry as a whole but the actual releases for that period were more than 50 per cent in excess of the prescribed figure, being in point of fact over 3 million proof gallons. A large part of these additional releases took the form of supplies of Scotch whisky which were only available to the trade and to the public at prices very substantially in excess of the prices at which our brands are sold. It is to be hoped that the permitted increase of 600,000 proof gallons for the current period will have the effect of reducing the demand for these highly priced supplies, and so in some degree regulate what has been a most unsatisfactory position.

At the same time, however, it must be pointed out that the prospect of reaching pre-war volume of sales in the home market is extremely remote so long as the present rate of duty continues.

During the year under review the demands for the group's brands in the United States of America and in Canada were well maintained, but business with certain South American countries continued very difficult. The board regrets that once

again shipments to soft currency markets had to be curtailed.

In South Africa, good shipments were effected during the second half of the calendar year 1949. Since then importation of alcoholic beverages has been prohibited. It has now been announced, however, that permits will be granted to importers based on a percentage of their imports during the calendar year 1948. While the quantities for entry will prove quite inadequate to meet demands, it is satisfactory that this important market is opening up again to some extent to our products.

I am happy to report a satisfactory year's trading on the part of our gin companies. Sales show substantial increases in both home and export markets, which is at once a reflection of the popularity of our brands of gin with the public, and a tribute to their high standard of quality. Our American gin sales during the year under review constitute a record.

Molasses Prices

Production at the company's yeast factories continued at a high level, and reasonable profits were derived from this section. As will be explained later on, the price of molasses for delivery in the near future is uncertain, and it may well prove necessary, in course, to offset the anticipated rise in price of this main raw material by an increase in the price of yeast to the consumer.

I am glad to say that the year under review has been a very active and satisfactory one throughout the industrial branch of the company. Reflecting, no doubt, the general improvement in trading conditions in most industries, the demand for industrial alcohol and the chemical products which we manufacture has shown a substantial increase during the past year, including an expansion in our direct chemical export trade.

Raw Materials Purchasing

In my previous report, I stated that there appeared to be a prospect of securing forward supplies of molasses at reasonable prices, and we were fortunate in covering our requirements for a greater part of the current year. The further outlook, however, is much less favourable, due partly to the shortfall in the Cuban crop last season, coupled with the unexpectedly high demands for molasses from the U.S.A., and indeed, throughout the world. At the moment, the forward position is obscure, but there appears to be every likelihood of a substantial rise in the price of molasses. Our purchasing arrangements through the United Molasses Co., Ltd., will, we hope, safeguard our position as far as

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it is possible in an admittedly difficult market.

The major expansion scheme at the Hull factory of British Industrial Solvents is now nearing completion. During the past few months, various sections of the programme have been successfully commissioned, and these are now making an important addition to the range of solvents, plasticisers and chemical intermediates produced at this factory.

The progress made in the petroleum chemicals project at Grangemouth, under the auspices of British Petroleum Chemicals, Ltd., in which we are associated with the Anglo-Iranian Oil Co., Ltd., is very well maintained. The operation of this plant will considerably strengthen our position in the supply of important chemical raw materials. Among other products to be produced at Grangemouth will be a large quantity of synthetic ethyl alcohol which will assist in alleviating the difficult molasses position previously referred to.

Styrene Monomer

Some months ago it was announced in the Press that it was proposed to erect a plant at Grangemouth to manufacture styrene monomer, mainly required as an intermediate for the manufacture of polystyrene, a plastic material for which there is a large potential demand in this country. A new company—Forth Chemicals, Ltd.—has been formed to carry through this development, the capital of which is held as to two-thirds by British Petroleum Chemicals, Ltd., and one-third by Monsanto Chemicals, Ltd. This project is part of our general plan to develop at Grangemouth the manufacture of derivatives from the new materials made available to us from the petroleum chemicals plant to which I have made earlier reference.

Our business in liquid and solid carbon dioxide has continued to expand during the year and has necessitated further extensions in hand, and planned, to our productive facilities. The unrivalled services which our subsidiary, Carbon Dioxide Co., Ltd., is able to offer from its many production points strategically located throughout the country, together with the high quality of its products, should ensure that we continue to obtain our share of this expanding trade.

Distaquaine

The penicillin factory at Speke, Liverpool, has again had a satisfactory year. The improvements and additions to the plant are practically complete and the present rate of production and sales is now more than two-and-a-half times the output last year. We have recently marketed two

new forms of penicillin, Distaquaine (an aqueous suspension) and Distaquaine Fortified, both of which have been extremely well received by the medical profession, incorporating, as they do, improved methods for administering penicillin. Development work is continuing with results which it is hoped will enable the company to make further contributions to this field in the future.

There has been a marked recovery in the plastics industry generally, from which we have benefited. The full output of the British Geon polyvinyl chloride plant at Barry, South Wales, has proved insufficient to meet consumers' demands, and a 50 per cent increase in capacity will shortly commence production. The outstanding quality of Geon polyvinyl chloride is widely recognised and is opening up a constantly expanding field of application.

The British Resin Products factory at Barry is now complete and their operations at Feltham and Tonbridge have been transferred to Barry. The wide range of products made at this factory includes thermosetting and thermoplastic moulding powders; paint and varnish resins; resins for the impregnation of wood, paper and fabric; and synthetic adhesives. A recent addition is polystyrene, which should prove of value to our trading operations. We are now beginning to derive benefit from the centralisation of our plastics production in South Wales, which provides greater and improved facilities for production and for research and development.

Commonwealth Associates

Our associate companies in Australia and South Africa continue to make progress in their respective chemical fields, with satisfactory trading results.

The company's extensive research services continue to play an important part in the development programme in which we are now engaged. Although our research is primarily for this purpose, it is gratifying to record that a number of processes developed by our research department have attracted interest in various parts of the world, particularly the U.S.A., and the licensing of these will, it is hoped, make an increasing contribution to our revenue.

While it is not desirable under present world conditions to make any forecasts, it is satisfactory to report that, so far as the current year has gone, the profits earned by the company are in excess of the standard of the year to March 31, 1950.

Once again it is a pleasure to pay tribute to the staffs—both in works and offices—for their excellent work, their devotion and their loyalty throughout the past year.

The report was adopted.

The Stock and Chemical Markets

STOCK markets earlier in the week were uncertain, although active, pending the outcome of the vital Parliamentary steel debate. General Election uncertainties caused a reaction in British Funds, which later tended to rally. Industrial shares have been inclined to move higher in response to the prevailing view that most companies should be able to maintain their dividends for the current year. Iron and steel shares are below their scheduled take-over levels. The latter, and the exchange into steel stock, would mean a big loss of income for holders, even if the new steel stock carried interest of $\frac{3}{4}$ per cent. Rumours that the North Koreans may break off hostilities led to some sharp declines in commodity and metal prices. Tin, at the time of writing, has lost more than £30 at £760 per ton; rubber was more than 2d. easier at 3s. 10d. per lb.

Chemical and kindred shares generally have been firm, Imperial Chemical at 42s. 10½d., buyers coming in on general confidence that the 10 per cent dividend is likely to be maintained for the current year. Monsanto were 50s. 9d. and Albright & Wilson were up to 31s. 9d. in the belief that the company may be planning a closer collaboration with the Dow Chemical Company and the Corning Glassworks, in the U.S.A.

Brotherton 10s. shares remained at 20s. Laporte Chemicals 5s. units were 10s. 7½d., W. J. Bush 55s. 6d., Amber Chemical 2s. shares 2s. 9d., F. W. Berk 10s. 6d., Boake Roberts 30s. 3d., Pest Control 5s. shares 6s. 9d. and L. B. Holliday 4½ per cent preference 19s. 9d. Fisons strengthened to 26s. 9d. United Glass Bottle have been firm at 75s. and Triplex 10s. units remained active, although at 25s. 9d. they have not held their best prices.

Shares of plastics companies have become firmer, following the statement at the Distillers' annual meeting that conditions in the plastics industry have improved. De La Rue were 24s. 3d., Kleemann 10s. 3d. and British Xylonite moved up to 82s. 6d. The 4s. units of the Distillers Co. itself were good at 19s. 6d. on the chairman's statement that the uptrend in the group's profits is continuing in the current year, thanks partly to first benefits from the big expansion and development programme. The market is impressed by this and by the widespread chemical and industrial interests of the group. United Molasses have been active up to 46s. 9d., reacting to the higher price of molasses. Turner &

Newall were firm at 83s. 9d. on higher dividend possibilities and there was again demand for British Glues, which were up to 22s., although now "ex" the bonus shares.

Glaxo Laboratories 10s. units were firm at 48s. 9d., Boots Drug 49s. 6d. and Borax Consolidated 54s. 6d. Among paints, Pinchin Johnson were higher at 42s. 6d. and Lewis Berger 29s. 4½d. Lever & Unilever firmed up further to 42s., helped by the Ministry of Food's decision to cease bulk buying of cocoa and hand over the market again to private enterprise.

Dunlop Rubber were 61s. 7½d., Beechams deferred firm at 14s. 7½d., General Refractories 22s. 10½d. In oil shares, Anglo-Iranian rallied strongly to 6 5/8d., Shell were firm at 63s. 1½d., Canadian Eagles rose to 28s. 8d., and Ultramar, despite the lower production figures, were slightly higher at 17s. 1½d.

Market Reports

AFIRM price position is recorded in almost sections of the chemicals market, with a sustained demand from the chief home consuming industries. Export trade has again been on a good scale and inquiry for shipment is thought to cover a wider range of industrial chemicals. There is no special feature to report about the soda compounds, supplies of which appear to be adequate to meet the demand. Offers of potash chemicals are finding a ready outlet. The call for non-ferrous compounds remain steady, on the recent advance in quotations. There is a good request for bleaching powder, liquid chlorine and formaldehyde. In the coal tar products market there is a persistent demand for the light distillates and values throughout remain firm against a none too plentiful supply. Export trade is brisk with offers of ADF cresylic acid readily absorbed.

MANCHESTER.—Strong price conditions for heavy chemical products continue in almost all sections of the Manchester market. Delivery specifications for home-trade users are now circulating steadily. A substantial aggregate of new business in the soda compounds and other staple products has been placed during the past few days by the cotton textile mills and other industrial users. Export business has been pretty well maintained. Moderate buying interest

(continued at foot of next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BROOKS' DYE WORKS, LTD., Bristol. (M., 23/9/50). Aug. 17, charge, to Bristol Permanent Economic Building Society securing £3000 and any other money, etc.; charged on 179 Whiteladies Road, Bristol. *£41,783. June 10, 1949.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 23/9/50). Aug. 23, £1000 debts, part of a series already reg. *Nil. July 22, 1949.

PEACOCK & BUCHAN, LTD., Southampton, mfrs. of compositions for ships' bottoms etc. (M., 23/9/50). Aug. 10, £1000 debt, to Miss A. M. Buchan, Burley and others; general charge. *£2300. June 5, 1950.

PRINCE REGENT TAR CO., LTD., London, W.C. (M., 23/9/50). Aug. 16, debt, to Prudential Assurance Co., Ltd., securing £150,000 with premium not ex. 1 per cent payable in certain events; charged on properties at Diss, Hertford and Silvertown, with fixed plant, machinery, etc. *Nil. Jan. 13, 1950.

WHITE SAND & SILICA CO., LTD., London, E.C. (M., 23/9/50). Aug. 22, mort. and deb., to District Bank, Ltd.; charged on land and buildings known as Pentrefelin Works, Pentrefelin, Llantilio; and a general charge. *Nil. Feb. 8, 1950.

Satisfactions

ADHESIVES (RADCLIFFE), LTD., mfrs. of adhesive substances. (M.S., 23/9/50). Satisfaction Aug. 23, of mort. reg. Feb. 10, 1949.

MERRIGLO, LTD. (formerly MERRIGLO (PLASTICS), LTD.), London, W. (M.S., 23/9/50). Satisfaction Aug. 18, of deb. reg. Nov. 11, 1949.

PALSCO, LTD., Biggleswade, chemists. (M.S., 23/9/50). Satisfaction Aug. 22, of mort. reg. May 29, 1946.

PILKINGTON BROTHERS, LTD., Liverpool, glass mfrs. (M.S., 23/9/50). Satisfaction Aug. 17, of deb. stock reg. Nov. 18, 1947, to the extent of £2500.

Company News

Albright & Wilson, Ltd.

An interim dividend of 10 per cent on the ordinary stock, less tax, has been declared by Albright & Wilson for the year ending December 31, 1950, payable on September 30.

The Distillers Co., Ltd.

A dividend on the preference stock of the Distillers Co., Ltd., for the six months ended September 30 has been declared at the rate of 3 per cent, less income tax, payable on November 15, to stockholders on the register at September 15.

Metal Industries, Ltd.

Gross trading profits and investment income of Metal Industries, Ltd., group totalled £1,058,548, including the profit of the new subsidiary, Cox & Danks, Ltd., for ten months, against a total last year of £996,254. Dividend of 10 per cent on the ordinary stock has been declared.

Powell, Duffryn, Ltd.

Powell Duffryn, Ltd., is maintaining at 8 per cent its distribution on the ordinary stock for the year ended March 31, with a final dividend of 5 per cent, payable on October 31. The consolidated net profit for the year amounted to £647,073, compared with the previous year's £652,106.

Sangers, Ltd.

Trading profits of the Sangers group for the year ended February 28 increased by £74,650 to £460,319, compared with the previous year. Dividend on the ordinary stock is maintained at 30 per cent.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

is being shown in fertilisers, with a fair trade passing in the by-products.

GLASGOW.—There has been a slight lull in the Scottish heavy chemical market this week, owing to the continually changing and advancing prices. The possibility of controls is stated in some quarters to be having a depressing effect. Exports are getting more and more difficult owing to heavy home demands.

New Source of Data for Radiochemists

AVALUABLE tool for nuclear physicists, radiochemists, and other workers in the rapidly expanding field of nuclear physics is now available in the tables of *Nuclear Data* recently compiled by the U.S. National Bureau of Standards. These tables, which may be obtained from the U.S. Government Printing Office, are to be followed by supplements of new material at six-monthly intervals.

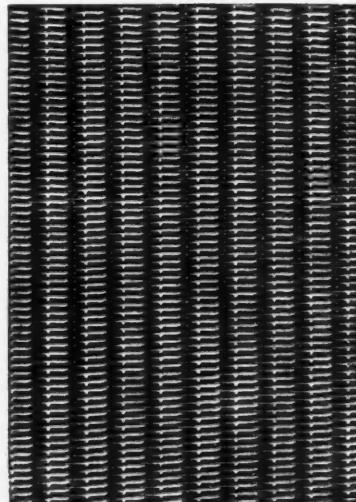
The initial volume of the tables, together with the supplements, will present a comprehensive collection of experimental values of half-lives, radiation energies, relative isotopic abundances, nuclear moments, and cross sections. Decay schemes and level diagrams, over 125 of which are included in the tables now ready, are to be provided wherever possible. At present over 1000 new measurements of different nuclear properties are being reported each year in some 30 different journals and in the reports of many different laboratories.

The National Bureau of Standards will have the assistance of the Oak Ridge National Laboratory, the Brookhaven National Laboratory, the Massachusetts

Institute of Technology, and the University of California Radiation Laboratory in making the first effort to present continuous and accurate information in this rapidly developing field. The present tables and the supplements to follow are therefore designed for easy assimilation of new material in loose-leaf form.

All the more recent values of a given nuclear property are listed in the tables, and thus, from the degree of uniformity of the results, the reader can tell at a glance the degree of certainty of the tabulated nuclear constants. References to over 2000 original papers make it possible for the research worker to evaluate the details of previous investigations and to design experiments to resolve existing discrepancies.

Circular 499, *Nuclear Data*, of 310 pages, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price \$4.25 a copy includes the cost of three supplements to be supplied at six-monthly intervals. The cost in this country is increased by one-third to cover postage.



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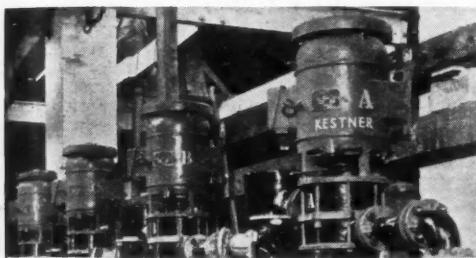
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A QUALIFIED CHEMICAL ENGINEER OR INDUSTRIAL CHEMIST, with experience in electrochemistry including brine electrolysis, is required for works near Chester, for the development of electrolytic and chlorine plant. Salary in accordance with qualifications and experience. Apply, giving full details, age, salary, etc., to Box C.A. 2950, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

CHEMIST or CHEMICAL ENGINEER required with really good process experience. Applicants must possess initiative, and resourcefulness in a high degree. These qualities will command a good salary. Age 25/40. A contributory pensions scheme is in operation and help will be given in the housing problem. Apply : Personnel Manager, THE MIDLAND TAR DISTILLERS, LTD., Oldbury Nr. Birmingham.

THE Civil Service Commissioners invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER**, to be filled by competitive interview during 1950. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science. Candidates must have obtained a University Degree in a Scientific subject (including Engineering) or in Mathematics with first- or second-class honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' Post-Graduate or other approved experience. Candidates for Scientific Officer posts, taking their degrees in 1950, may be admitted to compete before the result of their degree examination is known.

Age Limits: For Senior Scientific Officers, at least 20 and under 31 on 1st August, 1950; for Scientific Officers, at least 21 and under 28 (or under 31 for established civil servants of the Experimental Officer class) on 1st August, 1950. **Salary Scales:** for men in London: Senior Scientific Officers, £700 to £25-£900. Scientific Officers, £400 to £25-£650. Rates for women are somewhat lower.

Further particulars from the Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1, quoting No. 2887. 6773/200/JH

FOR SALE

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating, also lumps ground and granulated ; established 1830 ; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Inchicore" Mills, Bow Common Lane, London, E. Telegrams, "Hilljones, Bochurch, London." Telephone : 3255 East.

CHEMICAL BALANCE "MICROD" by Griffin & Tatlock, Ltd., complete with weights and case; in perfect condition.

ELECTRICAL EQUIPMENTS (CARDIFF) LTD., Dumballs Road, CARDIFF.

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FOR SALE

VARIOUS MIXERS FOR SALE

BAND CONVEYOR, 50 ft. long 40 in. wide, steel frame, motorised, for boxes, cases, bags, etc.

A FILTER PRESS, 31 $\frac{1}{2}$ in. square, fitted with 42 C.I. plates, centre fed.

FILTER PRESS, 25 in. square, fitted with 24 plates, cast iron built and steam heated.

Four GARDNER HORIZONTAL MIXERS, for powders, from 100 lbs. to 250 lbs. capacity, all motorised, three with Radicon Reduction Gear Boxes and one with a Spur Gear Drive.

Two large unjacketed WERNER MIXERS, belt and gear driven, hand tipping, double "Z" arms, pans 53 in. by 45 in. by 36 in. deep.

No. 200 One nearly new WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR. Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gear, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 204 One WERNER PFLEIDERER MIXER OR INCORPORATOR, similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One DITTO by WERNER PFLEIDERER, with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One HORIZONTAL "U"-SHAPED MIXER, steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One HORIZONTAL MIXER as above.

No. 211 One HORIZONTAL MIXER as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application.

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DOUBLE "Z" MIXER. Tilting pan, 48 in. by 36 in. by 30 in. Packed glands.

MORTON DUPLEX MIXER. "Z" blades, 2 speeds, 20-gallon size. Safety cover, with or without 5 h.p. 3-phase motor.

LIQUID MIXING VESSEL, 3 ft. 6 in. diam. by 3 ft. 10 in. deep; bottom discharge. Ditto, 25 in. by 32 in.

"U" POWDER MIXER, self discharging; take 20 cu. ft. of material.

STAINLESS STEEL TANK, two compartments, each 250 gallons. With brine or steam coil in insulated jacket.

VELOX HORIZONTAL STERILIZER, 2 ft. 6 in. diam. by 4 ft. long, with steam coil. Quick-close door. All fittings.

HANLOVE SWAN-NECK HYDRO, 30 in. perforated cage.

COPPER COATING PAN, jacketed, 28 in. diam.

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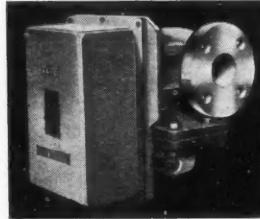
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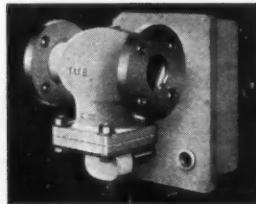
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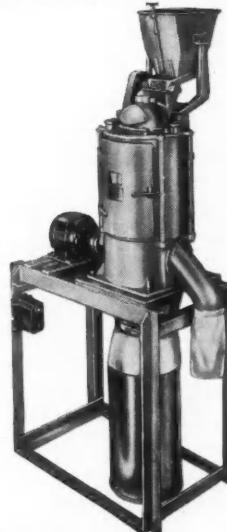
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